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G. W. WHITTINGTON.

KNOTTING MECHANISM FOR TWINE BINDING HARVESTERS.

No. 567,627. Patented Sept. 15, 1896.

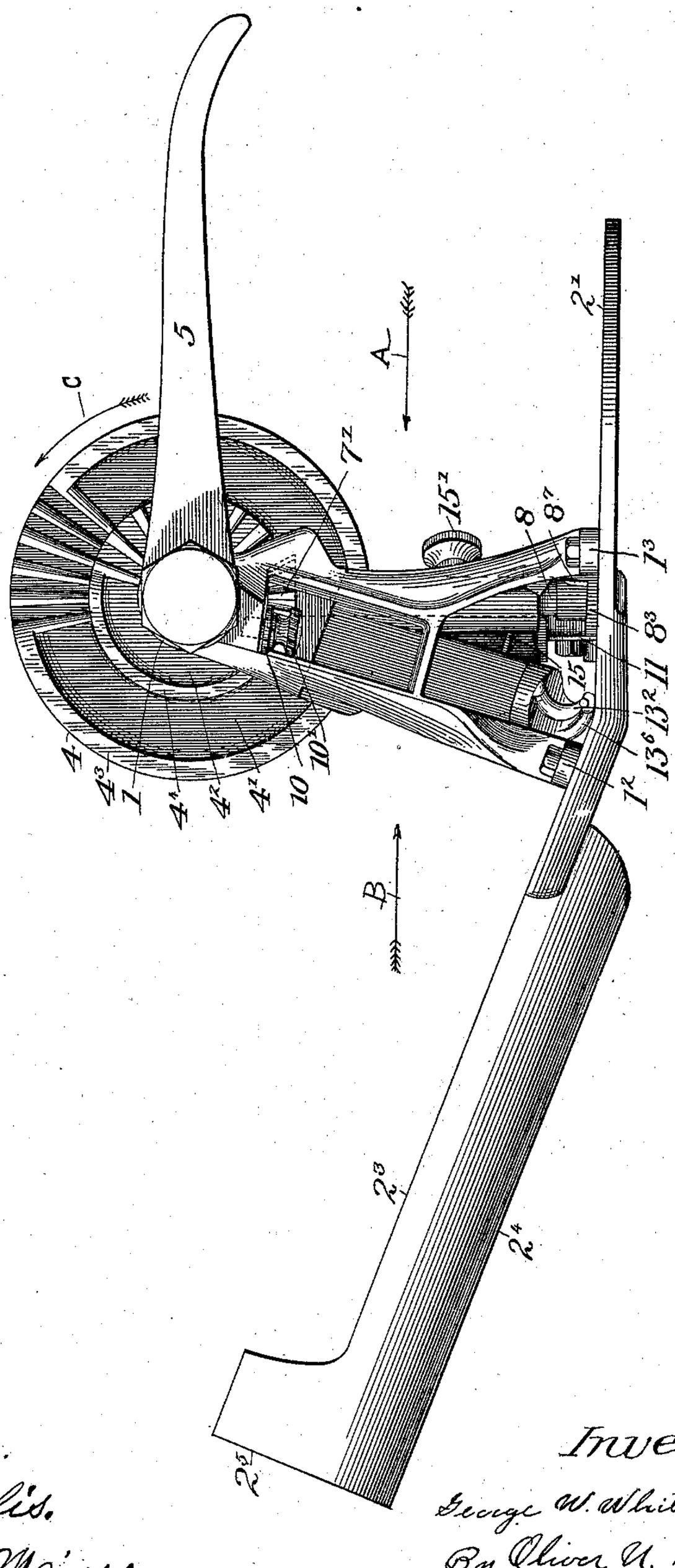

Fig. 1.

Witnesses.
J. M. Willis.
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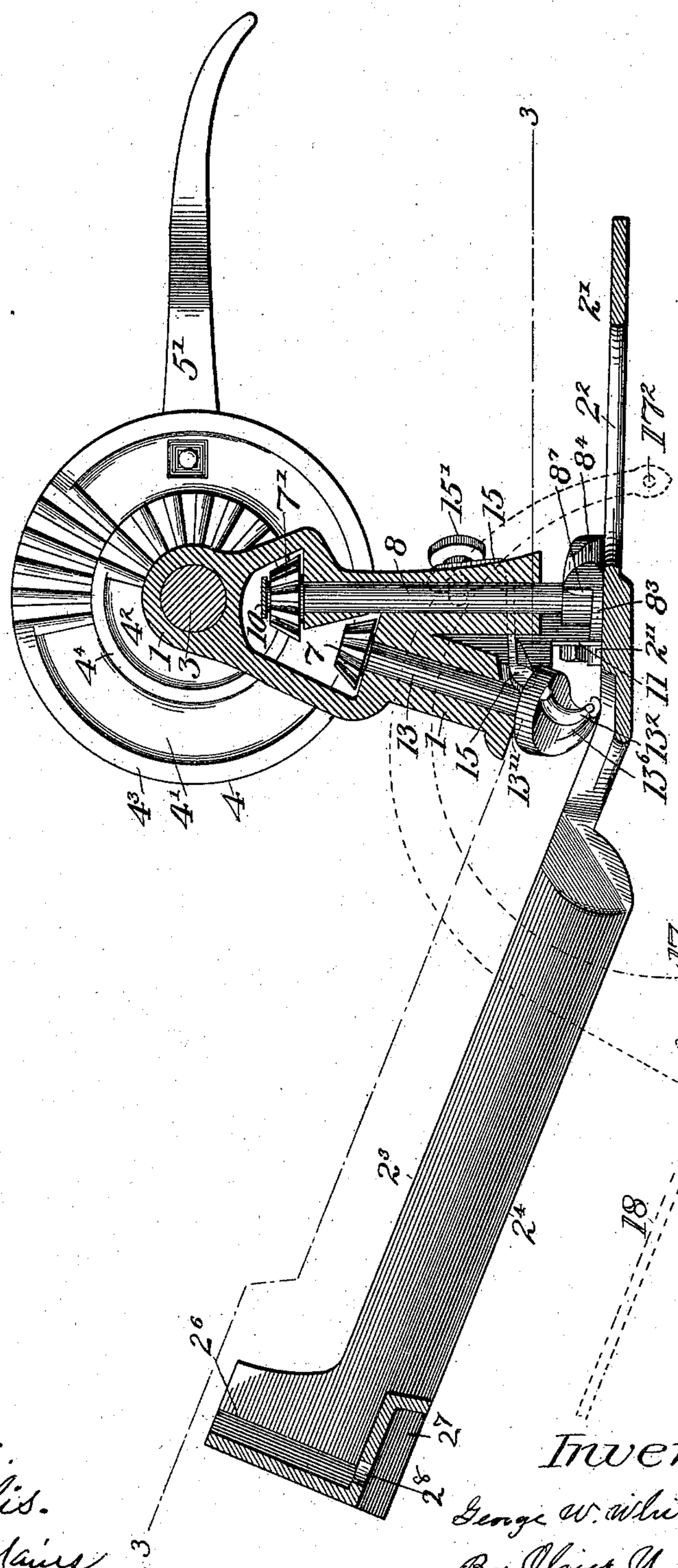

Fig. 2.

Witnesses.
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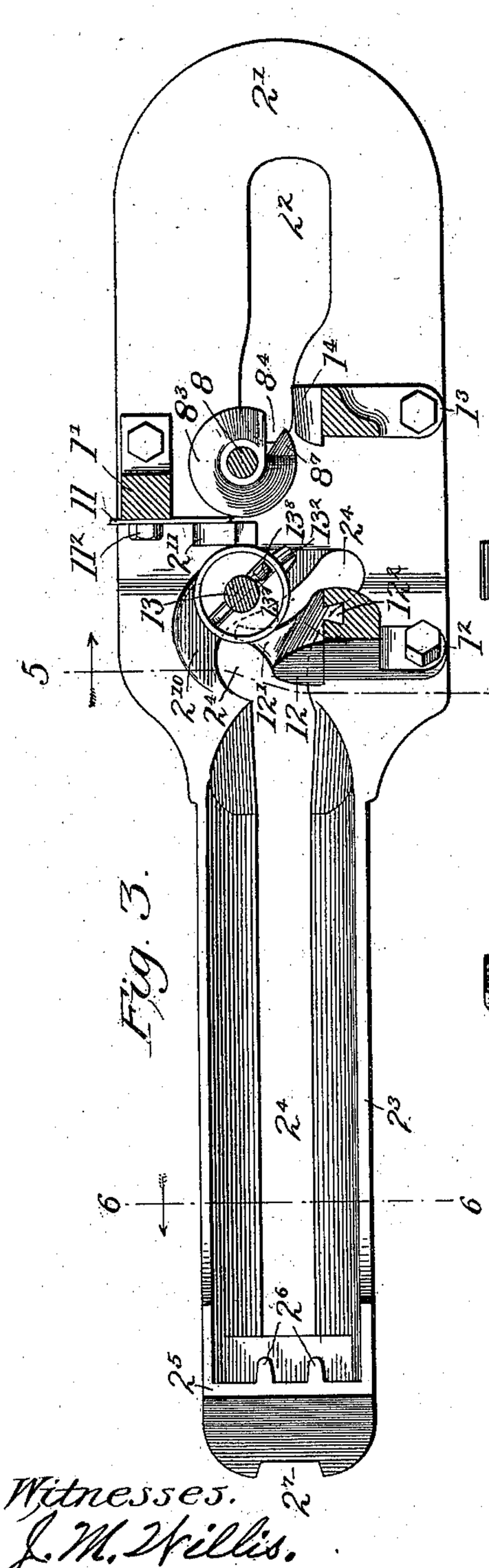

Fig. 3.

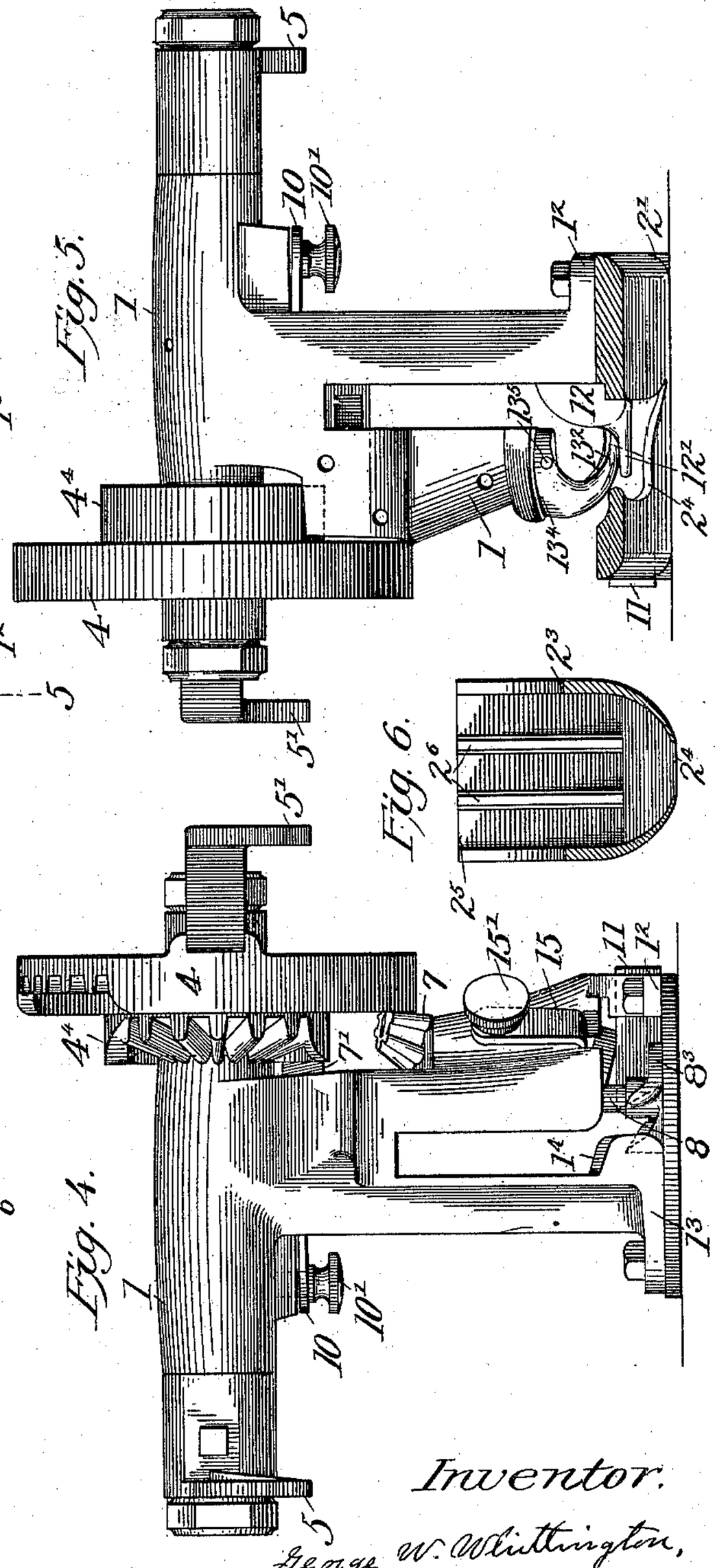

Fig. 5.

Fig. 6.

Fig. 4.

Witnesses.
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(No Model.) 4 Sheets—Sheet 4.

G. W. WHITTINGTON.

KNOTTING MECHANISM FOR TWINE BINDING HARVESTERS.

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Fig. 7

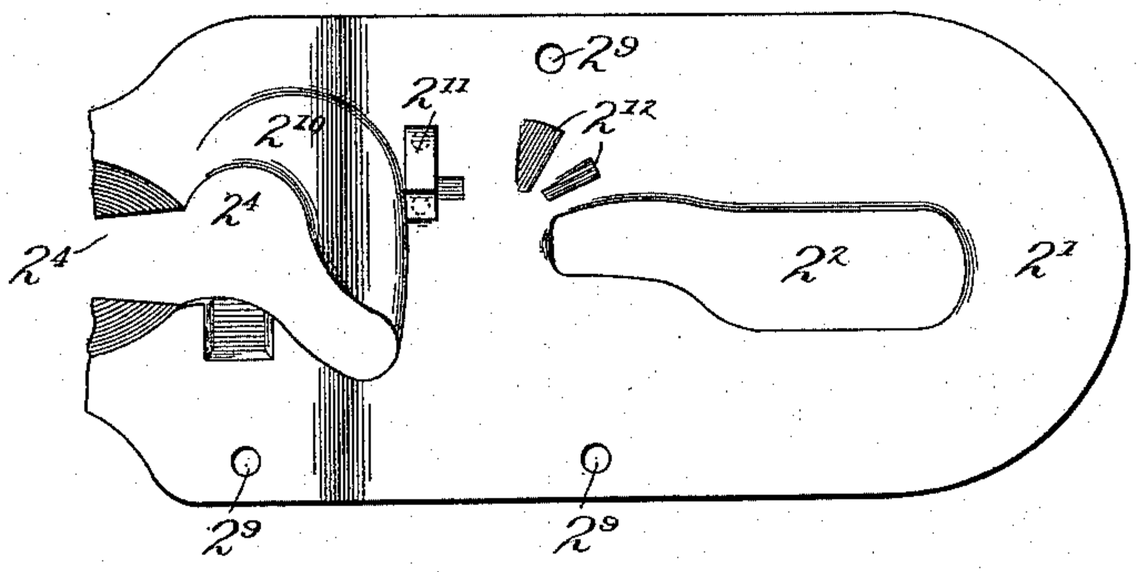


Fig. 8.

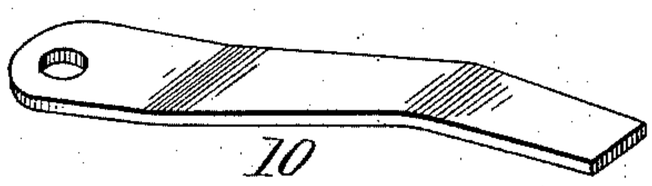


Fig. 9.

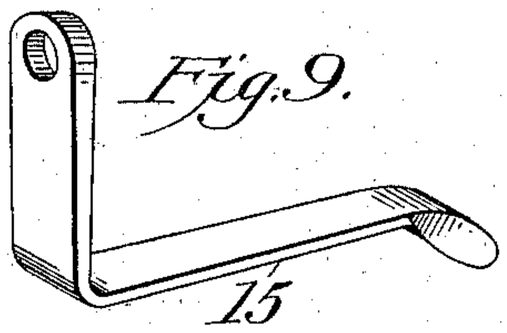


Fig. 10.

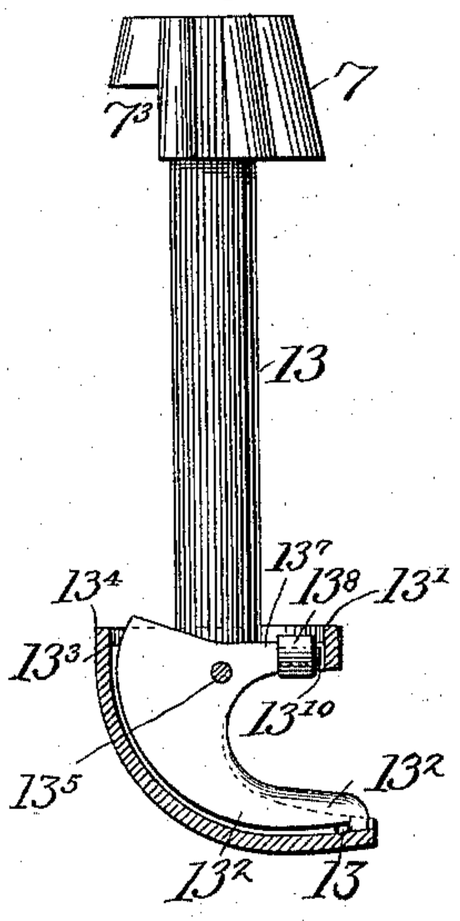


Fig. 11.

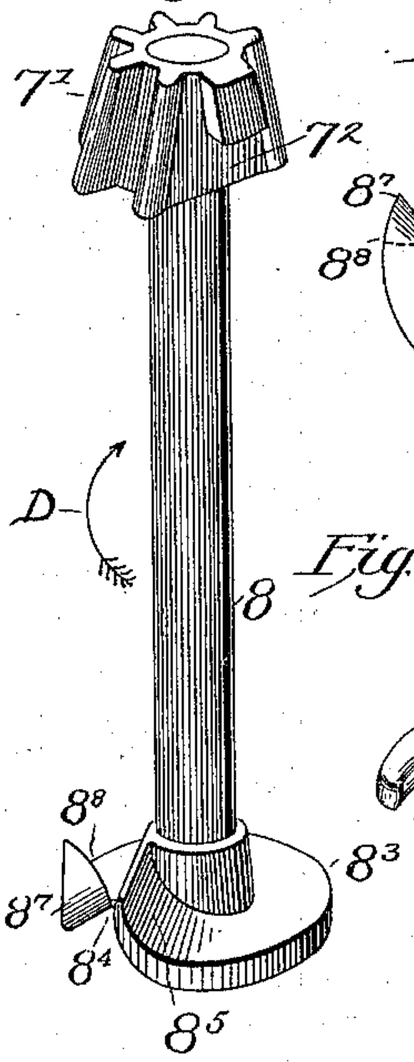


Fig. 12.

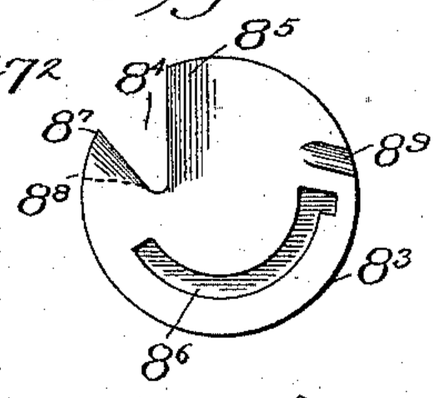


Fig. 13.

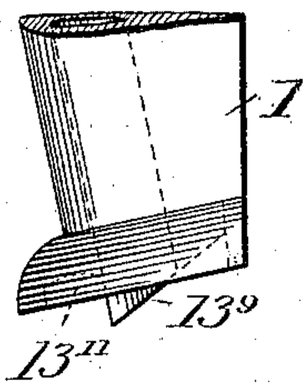


Fig. 14.

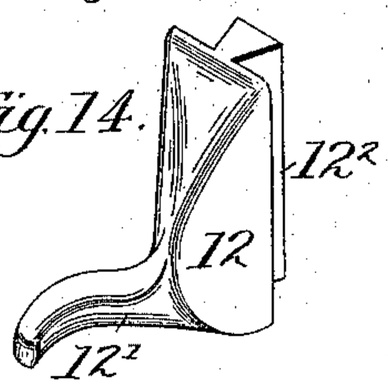
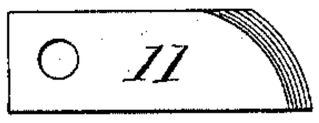


Fig. 15.



Witnesses.
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George W. Whittington,
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His Attorney.

UNITED STATES PATENT OFFICE.

GEORGE W. WHITTINGTON, OF NEW MARKET, INDIANA.

KNOTTING MECHANISM FOR TWINE-BINDING HARVESTERS.

SPECIFICATION forming part of Letters Patent No. 567,627, dated September 15, 1896.

Application filed July 5, 1894. Serial No. 516,687. (No model.)

To all whom it may concern:

Be it known that I, GEORGE W. WHITTINGTON, a citizen of the United States, residing at New Market, in the county of Montgomery and State of Indiana, have invented certain new and useful Improvements in the Knotter Mechanism in Twine-Binder Harvesters, of which the following is a specification.

My invention relates solely to improvements in the knotter mechanism of twine-binder harvesters, and has for its object in general the production of a new and useful knotter mechanism; and to this end my invention consists in the peculiar construction, combination, and arrangement of the several parts, as is fully set forth in the following description and claims. This object has been successfully attained by the knotter and holder mechanism illustrated in the accompanying drawings, forming a part of this specification, in which—

Figure 1 is a side elevation of the knotter mechanism entire. Fig. 2 is a vertical half-section of the knotter mechanism. Fig. 3 is a top plan view taken on the line 3 3, Fig. 2. Fig. 4 is a view of the knotter mechanism obtained by looking at it in the direction shown by the arrow A, Fig. 1. Fig. 5 is a view taken on line 5 5, Fig. 3, obtained by looking at the knotter mechanism in the direction shown by arrow B, Fig. 1. Fig. 6 is a sectional view of the breastplate, taken on line 6 6, Fig. 3. Fig. 7 is a top plan view of a portion of the breastplate. Fig. 8 is a detail view of the steel spring 10. Fig. 9 is a view in detail of the bent steel spring 15. Fig. 10 is a view of the knotter. Fig. 11 is a view of the circular twine-holder. Fig. 12 is a plan view showing the bottom side of the circular twine-holder 8^3. Fig. 13 is a view of a portion of the knotter-frame just above and adjacent the knotter-hook 13′, showing the inclined annular cam 13^9 on the under side thereof. Fig. 14 is a detail view of the twine-guide 12. Fig. 15 is a side elevation of the knife 11.

Like numbers of reference indicate corresponding parts throughout the several views.

The supporting-framework of my machine consists of a knotter-frame 1 and a breastplate 2, which are provided with all the necessary slits and openings essential to enable the various operating parts to properly perform their respective functions.

3 is the driving-shaft which operates the knotter mechanism and revolves in the direction shown by the curved arrow C, Fig. 1.

In common with a number of other twine-binder harvesters, the driving-shaft 3 starts automatically and makes one complete revolution from time to time, as bundles accumulate of proper size to be bound by the knotter mechanism. The driving-shaft 3 passes horizontally through the upper portion of the knotter-frame 1 and turns freely in its bearing therein, and causes the principal knotter-wheel 4 and the discharge-arms 5 and 5′, which are rigidly fixed to the driving-shaft, to revolve therewith. There is a large and a small annular groove 4′ and 4^2, respectively, formed in the face of the principal knotter-wheel 4. A section of cogs in the large annular groove 4′, standing up from the bottom of said groove, meshes with a small cog-wheel 7 and causes it to make one complete revolution while engaged with said section of cogs. In like manner there is a section of cogs standing up from the bottom of the small annular groove 4^2, which meshes with a small cog-wheel 7′ and imparts to it one complete revolution at each engagement with said section of cogs. I make such adaptations of the small cog-wheels 7 and 7′ and the principal knotter-wheel 4 to each other by means of the gliding surfaces 7^2 and 7^3 on the small cog-wheels and the annular rims 4^3 and 4^4 on the principal knotter-wheel that after the small cog-wheels 7 and 7′ have made a complete revolution by their engagement with said sections of cogs they are then held stationary while the principal knotter-wheel completes its own revolution.

5 and 5′ are discharge-arms that eject the bound bundles out from under the knotter mechanism upon the ground. Arm 5′ has a bent portion, which enables it to clear the breastplate in making its revolution.

The knotter consists of a rotatable shaft 13 mounted in a suitable bearing in the knotter-frame 1, a small cog-wheel 7 rigidly fixed on the upper end of said shaft, a circular knotter-hook 13′ securely mounted on the lower end of said shaft, and a U-shaped knotter-jaw 13^2

pivoted in a suitable pocket in the knotter-hook. The small cog-wheel 7, fixed rigidly on the upper end of shaft 13, meshes with the outer section of cogs on the principal knotter-wheel 4, which causes it to make one complete revolution, after which it is held stationary by means of a gliding surface 7^3 on its under side, which glides against the annular rim 4^3 of the principal knotter-wheel 4 while the principal knotter-wheel completes its own revolution.

13′ is the circular knotter-hook, mounted securely on the lower end of its shaft 13, with the plane of its circular face at right angles to the axis of the shaft which passes centrally through the circular plan of its body portion. There is an annular groove 13^3 formed in the face of said knotter-hook concentric with the axis of its shaft 13, encircled by an annular rim 13^4. The U-shaped knotter-jaw 13^2, which fits its central pocket in the knotter-hook 13′ and shaft 13, oscillates through a small angle about its pivot-pin 13^5, which is passed through said knotter-hook and shaft just below the bottom of the annular groove 13^3 in its circular face. The axes of the shaft 13 and the pivot-pin 13^5 intersect each other at right angles. The U-shaped knotter-jaw has two arms, a lower arm 13^6 and an upper arm 13^7, provided with a small antifriction-roller 13^8 journaled on its outer end. Any slight saving of friction at this point is a great saving of horse-power. The pivot-pin 13^5 is mounted in an opening 13^{10} in the knotter-jaw and knotter-hook. One complete oscillation is imparted to the knotter-jaw about its pivot-pin at each revolution of the knotter-hook by an irregular annular cam 13^9 on the under side of the knotter-frame 1, concentric with the axis of the shaft 13. The annular cam 13^9 and the bent steel spring 15 are organized and adjusted to coöperate with each other, and with the revolving knotter-hook to oscillate the knotter-jaw at the proper time, which opens and receives the strands of twine between its lower arm and a corresponding projection of the knotter-hook, and clamps the twine strands therebetween and allows the looped ends of the severed strands to be drawn off of the knotter with the ejection of the bundle by the discharging mechanism.

13^9 is an annular cam on the under side of the knotter-frame 1, which stands out into the annular groove 13^3 of the knotter-hook, and 13^{11} refers to an annular groove which completes the circuit of the annular cam on the under side of the knotter-frame. The bottom and rim of this annular groove and cam form one continuous irregular gliding surface, which oscillates the knotter-jaw 13^2 about its pivot-pin, at the proper time and place, during the revolution of the knotter-hook, to receive and clamp the strands of twine between its lower arm and the knotter-hook, which loops the strands and allows the band to be drawn off of the knotter with the ejection of the bound bundle.

The pressure of the bent steel spring 15 at its inner end against the bottom of the annular groove 13^3 of the knotter-hook 13′ is regulated by means of an adjustable thumb-screw 15′, threaded in the knotter-frame through an opening in the upper outer end of said spring. The resilience of the bent steel spring keeps it gliding at its inner end against the bottom of the annular groove 13^3 of the knotter-hook, and it is held in position on the knotter-frame by an adjustable thumb-screw 15′ and a suitable groove on the under side of the knotter-frame, which also shields it. The bent steel spring applies its pressure to the upper arm of the knotter-jaw during only the icipient and later stages of a revolution of the knotter-hook, at which time the looped strands are drawn off of the knotter over the strands clamped therebetween, which are also withdrawn with the ejection of the bound bundle.

8 is a rotatable shaft, which turns freely in its bearing in the knotter-frame, and is provided at its upper end with a small actuating cog-wheel 7′, which is formed on the under side with a delay-surface 7^2 that glides against the annular rim 4^4 of the principal knotter-wheel, which holds the small cog-wheel stationary after it has made a complete revolution.

8^3 is a rotatable circular twine-holder integral with the lower end of shaft 8, which is provided with an elongated slot 8^4 that projects inwardly from its periphery, in which a strand of twine is laid by the needle when properly performing its function.

1^4 is a rounded-off flange on the inner side of the knotter-frame standard 1^3, which deflects the twine strand into the elongated slot 8^4 of the circular holder. The circular holder revolves in the direction shown by the curved arrow D in Fig. 11, and has at the rear side of its elongated slot 8^4 an upstanding radial wall 8^5, rounded off underneath, which enables it to glide freely over the inlaid strand of twine. The circular holder is provided with a notch 8^9 about its periphery on the under side, into which the twine strand is lodged by the oscillatory needle as it returns to its stationary position, which carries the new strand around adjacent the knotter and allows it to draw out of said notch and down in front of the small projection 2^{11} of the breast-plate. By providing the circular holder with this peripheral notch 8^9 it is enabled to shift the new twine strand, which pointed toward the knife at first, around until its outer end points from the knife. A long annular-like indenture 8^6 on the under side of the circular holder, parallel with its periphery, glides onto and over the lower twine strand and remains over it while the holder is at rest, which prevents the strand drawing out during the accumulation of a bundle and during the incipient stages of the binding of a bundle. It has been found by the provision of this annular-like indenture 8^6 that the revoluble circular holder retains the lower twine strand bet-

ter with a slight pressure from its steel spring 10 than it does with a strong pressure from the steel spring without said indenture. It also enables the circular holder to be operated more freely in the performance of its several functions.

The circular holder is provided about its periphery in front of the elongated slot 8^4 with an upstanding lug 8^7, which has a vertical face 8^8, that thrusts the overlaid strand of twine against the knife 11 and severs it in passing the blade as the circular holder completes its revolution. The knife 11 is attached at the rear side of the knotter-frame standard 1′ by means of a set-screw bolt 11^2 threaded into the standard through an opening in the knife. The circular twine-holder shaft 8 is longitudinally movable in its bearing in the knotter-frame, which enables the circular holder to adjust itself suitably to any thickness of twine which is held securely between it and the breastplate. A steel spring 10, mounted horizontally in a suitable aperture in the upper portion of the knotter-frame, has a bearing at its inner end on the holder-shaft 8, which applies the spring's pressure against the twine strand between the circular holder and the breastplate. An adjusting thumb-screw 10′, threaded in the knotter-frame through an opening in the outer end of the steel spring 10, is provided as a means for regulating the spring's tension or pressure. The walls of the knotter-frame and the adjusting thumb-screw maintain the spring in its proper position.

12 is my twine-guide, which embodies a wedge-shaped body portion 12 that deflects the twine strands properly in position over the knotter jaw and hook 13^2 and 13′, a horn-like projection 12′ that holds the twine strands off from and rightly over said knotter jaw and hook, and an elongated tenon 12^2 that snugly fits a groove in the knotter-frame standard 1^2. The horn-like projection holds the twine strands correctly over the knotter jaw and hook while they are at rest and allows the strands to be drawn around it by the passage of the bills during the revolution of the knotter. The tenon 12^2 inserts snugly into its groove and is rigidly held therein by its lower end resting on the breastplate when the knotter-frame standard is bolted to the breast plate, which also rigidly fixes the twine-guide in position.

2 is the breastplate, of the form shown in the drawings and essentially a part of my invention, which consists of the foot 2′ and the U-shaped back 2^3. The foot is pierced with a needle-opening 2^2, which is slightly curved at its rear end to deflect the twine strand into the elongated slot 8^4 of the circular holder. A long needle-opening 2^4 pierces the U-shaped back 2^3 centrally at the under side. It will be noticed that the walls of the U-shaped back converge uniformly near the bottom into a plane surface, which is pierced by a circular-shaped continuation 2^4 of the needle-opening. A wall 2^5 closes the breastplate-head and has a pair of parallel flanges 2^6 standing out from its inner side. On the under side at the upper end is a rectangular recess 2^7 with its walls slightly and uniformly inclined toward each other as they approach the bottom, which is pierced with a bolt-aperture 2^8 between the lower ends of the parallel flanges 2^6 for the reception of a through-bolt, which fixes the breastplate rigidly to a binder-frame.

2^9 refer to bolt-apertures for bolting the knotter-frame to the breastplate.

2^{10} is a U-shaped indenture underneath the revoluble knotter, which allows it to knot the twine strands close to the bundle.

2^{11} is a small projection which braces the knife 11 and extends in front of its cutting-edge to hold the under twine strand off from the cutter-edge.

2^{12} are indentures on the breastplate just underneath the circular holder, in which the outer end of the twine strand from the ball, is caught and lodged as the circular holder completes its revolution thereover on the breastplate.

17 is a vibrating needle (shown by the dotted lines in Fig. 2) used in common with other twine-binders for carrying the twine through its openings in the breastplate and knotter-frame to the knotter and the circular twine-holder, and has its axis of oscillation at 17′

My knotter mechanism, in common with others for twine-binders, is adapted to be applied to any twine-binding harvester. The grain platform or decking 18 occupies an intermediate position between the breastplate of the knotter mechanism and the axis of the vibratory needle.

The operation of my knotter mechanism as a whole, while tying a knot, is as follows: Unless otherwise indicated the drawings show the attitude assumed by the apparatus during the accumulation of a bundle, at which time all the parts are at rest. At the proper time the needle has advanced through its usual openings in the breastplate and the knotter-frame, as shown in Fig. 2, and lays a strand of twine properly over the twine-guide, the knotter hook and jaw, and the circular twine-holder, and draws it into the elongated slot 8^4 of the circular holder. A rounded-off flange 1^4 on the knotter-frame standard and a curved rear end of the needle-opening 2^2 deflect and trail the twine strand securely in the slot 8^4. While the needle was thus in motion the principal knotter-wheel 4 has also been set in motion. Its outer section of cogs first falls in gear with the small cog-wheel 7 and sets in motion the knotter hook and jaw, which are timed and organized to loop the strands in the usual manner by means of an inclined annular cam 13^9 on the under side of the knotter-frame, and then the inner section of cogs falls in gear with the small cog-wheel 7′ and sets in motion the circular twine-holder 8^3 during the later stages of the revolution of

the knotter-hook, which glides over the twine strand in its slot 8^4 and clamps the strand between said holder and the breastplate. At this juncture in the coöperative movements of the knotter hook and jaw and the circular twine-holder the knotter hook and jaw have made, respectively, a complete revolution and oscillation, looped the applied band of twine, and are again at rest, while the vertical face 8^8 of the upstanding lug 8^7 has caught the twine strand overlying the circular holder and carried it against the knife 11, which severs the looped strand from the new strand. The looped strand may then be drawn off of the knotter by its free end with the hand. Just after the twine strand is severed the vibrating needle has returned to its stationary position and again the strand is properly laid over the twine-guide, the knotter, and the circular holder, and its outer end from the ball clamped between the circular holder, and the breastplate points toward the knife, and as the circular holder completes its revolution a notch 8^9 in its periphery, into which the over-laid strand is drawn by the needle, carries it around adjacent the knotter and allows it to draw out of said notch and down in front of the small projection 2^{11}, which holds it off from the cutting-edge of the knife 11 as its outer end is clamped securely between the circular holder and the breastplate. It will be noted here that the circular holder shifts by means of its notch 8^9 the new twine strand which pointed toward the knife at first around until its outer end points from the knife and which lodges in the indentures 2^{12}, which prevent said end from being shifted farther over the breastplate. At this period in the operation of the circular holder, which has shifted the new lower twine strand around adjacent the knotter by means of its notch 8^9, the annular-like indenture 8^6 on its under side glides onto and over the new lower twine strand and remains over it while the holder is at rest, and which prevents said strand drawing out during the accumulation of a bundle and during the incipient stages of the binding of a bundle. At a period in the revolution of the revoluble holder when its elongated slot 8^4 moves over said strand and points directly toward the knife the looped band is drawn from the knotter and circular holder with the ejection of the bound bundle by the discharging mechanism. During the changing of the new strand around adjacent the knotter by the notch 8^9 of the circular holder the J-shaped indenture 8^6 on its under side catches and carries the outer end of the new strand, which pointed toward the knife, around into the indentures 2^{12}, which stop the strand from being carried farther over the breastplate and leaves its outer end pointing from the knife instead of toward it. The projection 2^{11} extending in front of the cutting-edge of the knife holds this lower strand off and prevents it being severed. These peculiar coöperative constructions embodied in my knotter mechanism enable it to apply looped bands to the accumulated bundles successively without wasting a particle of twine. Presently the needle has advanced again through its usual openings in the breastplate and the knotter-frame, as shown in Fig. 2, and lays a second strand of twine properly over the twine-guide, the knotter hook and jaw, and the circular holder, while the accumulated bundle has been caught in the bight of the band of twine. Again the principal knotter-wheel has been set in motion, which revolves the knotter-hook and the circular twine-holder in the manner stated hereinbefore, which loops and severs the applied band of twine and clamps a new outer end from the ball between the circular holder and the breastplate, as before, while the looped ends of the applied band are drawn off of the knotter-hook by the bound bundle as it is ejected by the discharging mechanism. In the meantime the vibratory needle has again returned to its stationary position and properly laid a twine strand over the knotter hook and jaw and the circular holder, which have made a complete revolution and are at rest again with the twine strand in position ready for binding the next bundle.

The organization and operation of this knotter mechanism is such that it does not waste a particle of twine while applying and severing successively and consecutively its looped bands to the bundles of grain.

Having thus fully described my knotter mechanism and set forth the operation thereof, what I claim as my invention, and desire to secure by Letters Patent, is—

1. The knotter-frame, having a horizontal groove formed in its lower end, combined with an angular spring that is secured at its upper end to the frame, and having its lower end shaped so as to operate the jaw, combined with the rotating knotter-hook, the pivoted jaw placed inside of the hook, and a cam on the frame for opening the jaw, as the hook is revolved, substantially as set forth.

2. In a twine-binder, the knotter and the knotter-frame, having a dovetailed groove formed in one side of its lower end, combined with a twine-guide, formed in a single piece, and provided with a dovetailed tenon on one side to catch in said groove, and a horn-like projection on its lower end, said twine-guide being held in the groove by the breastplate bolted to the lower end of frame substantially as shown.

3. In a twine-binder, an endwise-moving and revolving twine-holder shaft, having a disk on its lower end, the disk being provided with a recess extending through its edge, a notch in its lower edge, and a circular groove in its bottom; one edge of the recess being curved upward its entire length, and the other edge being formed into a turned-up hook, substantially as described.

4. In a twine-binder, a twine holding and cutting mechanism consisting of a revolving

shaft, a circular holder-disk at the lower end of said shaft, and having in its under surface an elongated notch extending from the periphery of the disk, and a circular-shaped groove in said surface and lying within the periphery of the disk; a recess extending through the disk from its periphery to the shaft, and an upwardly-curved edge or lug at the near edge of the recess, a holder portion in said disk being adapted to engage with the surface of the breastplate and to coöperate with indentures in the breastplate to catch and lodge the outer end of the twine strand from the ball, combined with an adjustable knife fixed rigidly to the knotter-frame standard, and which severs the upper twine strand brought against it by the curved-up edge or lug of the disk, coincidently with the looping of the strand by the knotter while the new outer end of the twine strand is caught, clamped, and adjusted by the circular holder, substantially as set forth.

5. In a twine-binder, the knotter-frame supporting the operating parts, the breastplate rigidly bolted to the frame and provided with the indentures 2^{12}, the revolving shaft provided at its upper end with an actuating means and at its lower end with the disk provided with an opening through one edge and having a turned-up lug upon one edge of the opening, and a turned-up hook upon the other, a peripheral notch in its lower side, and a circular groove also in its lower surface; a spring mounted in the upper end of the knotter-frame, and a set-screw for regulating the pressure of the spring, the parts being combined and arranged to operate, substantially as specified.

6. In a twine-binder, a breastplate having a foot and a U-shaped back and a small projection on the foot which braces the knife and extends in front of its cutting edge to hold the lower twine strand off therefrom which prevents it being severed, substantially as specified.

7. In a twine-binder, a breastplate having a foot, a U-shaped back, and a twine-holder portion, integral with the foot, and having indentures which catch and lodge the outer end of the twine strand from the ball, combined with a revolving cord-holder and a knotter, substantially as shown.

8. In a twine-binder, a breastplate, and a twine-holder portion provided with indentures which catch and lodge the outer end of the twine strand, and the small projection on the foot of the breastplate which braces the knife and holds the lower twine strand off from the cutting edge of the knife, combined with the revolving cord-holder, substantially as described.

GEORGE W. WHITTINGTON.

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