

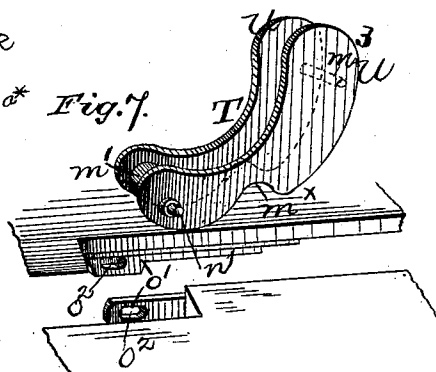
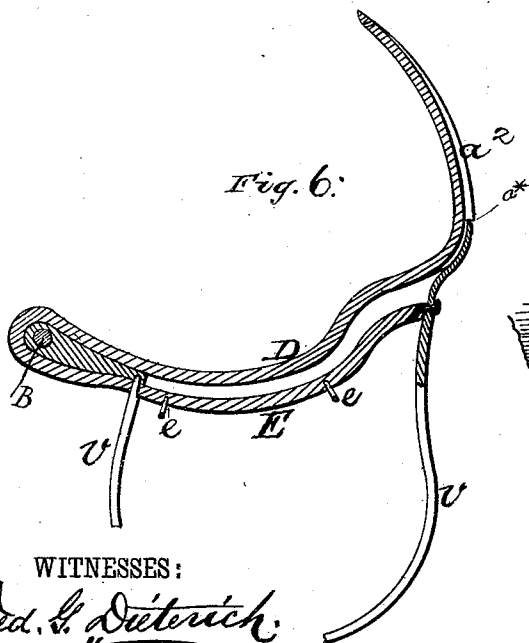
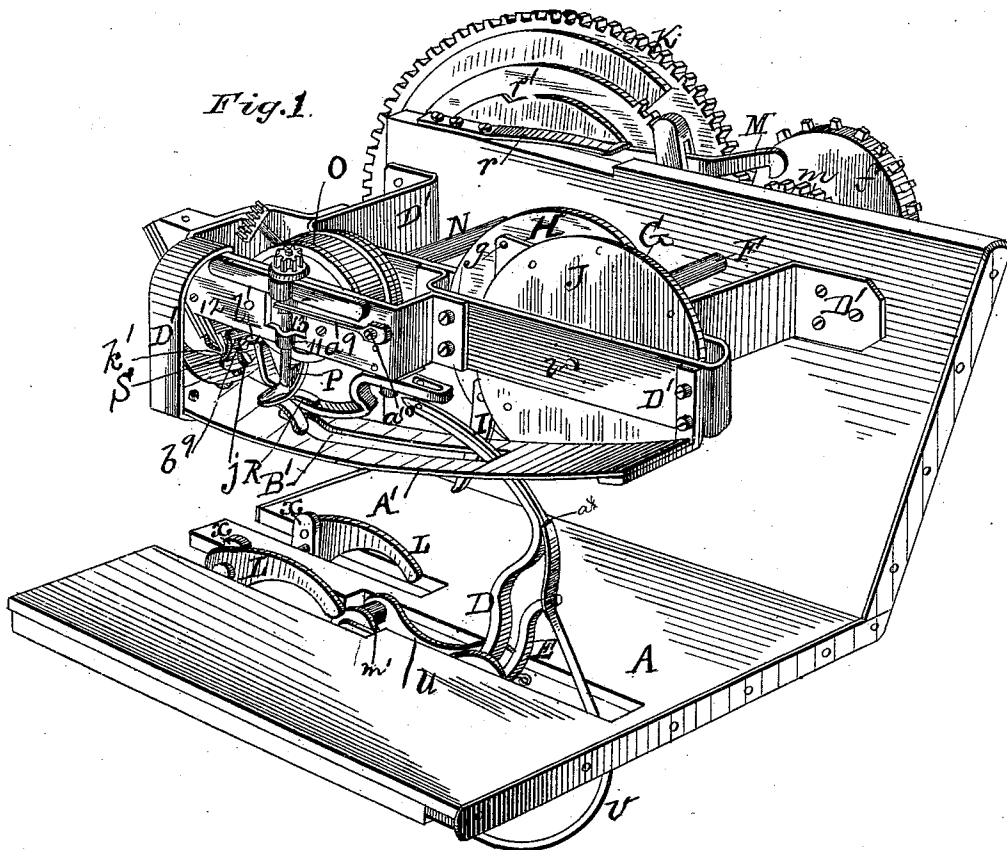
(Model.)

4 Sheets—Sheet 1.

W. VAN HORN.
GRAIN BINDER.

No. 273,325.

Patented Mar. 6, 1883.



WITNESSES:
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(Model.)

4 Sheets—Sheet 2.

W. VAN HORN.

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Fig. 2.

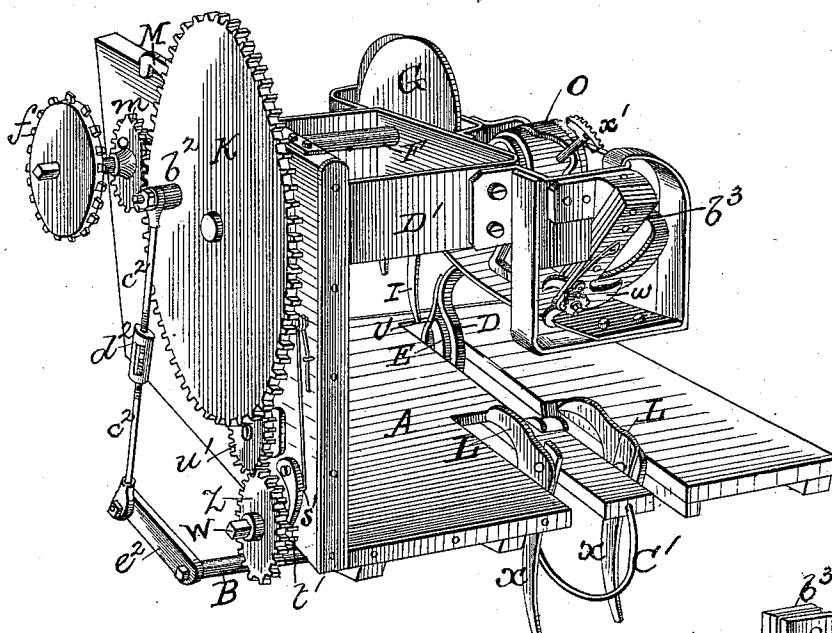


Fig. 3.

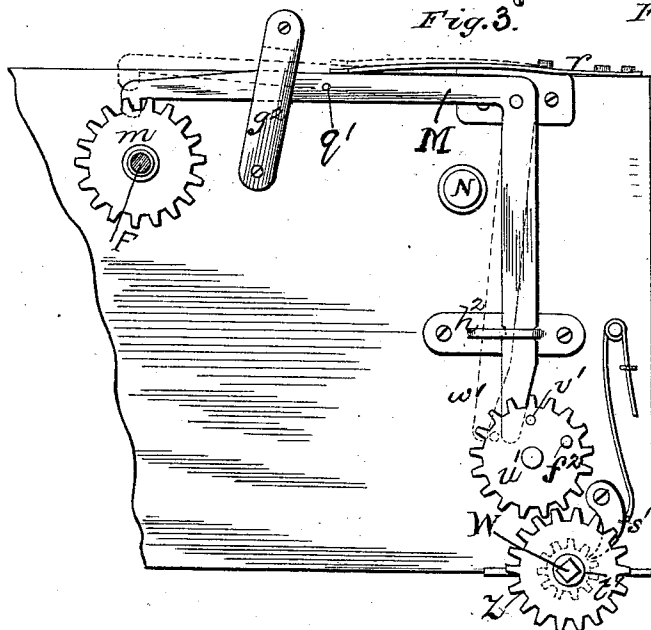
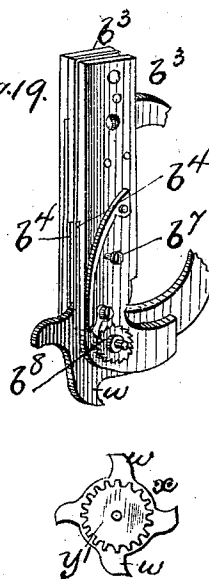


Fig. 19.



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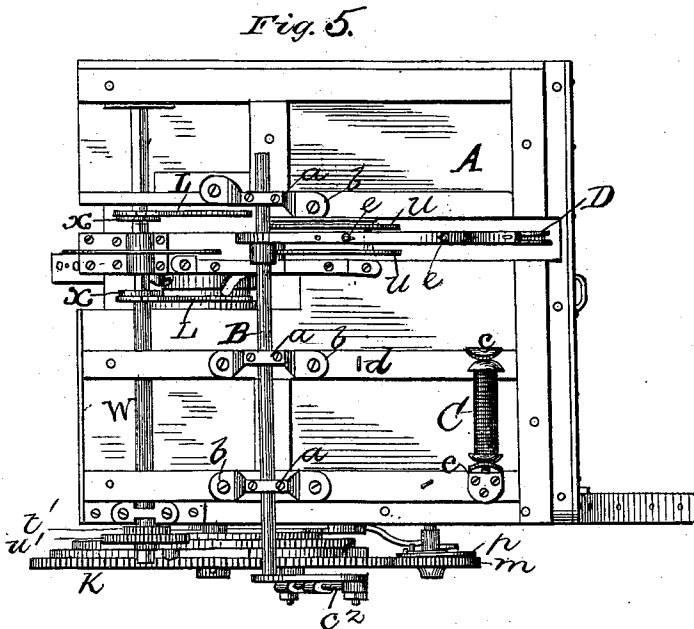
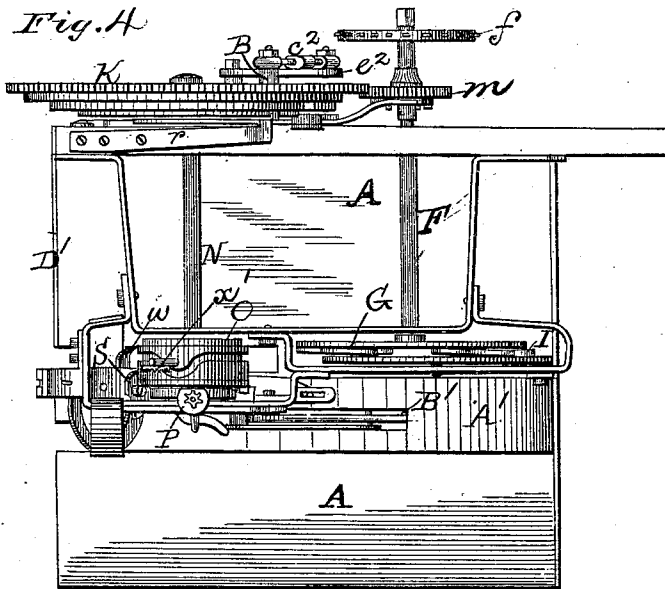
(Model.)

4 Sheets—Sheet 3.

W. VAN HORN.
GRAIN BINDER.

No. 273,325.

Patented Mar. 6, 1883.



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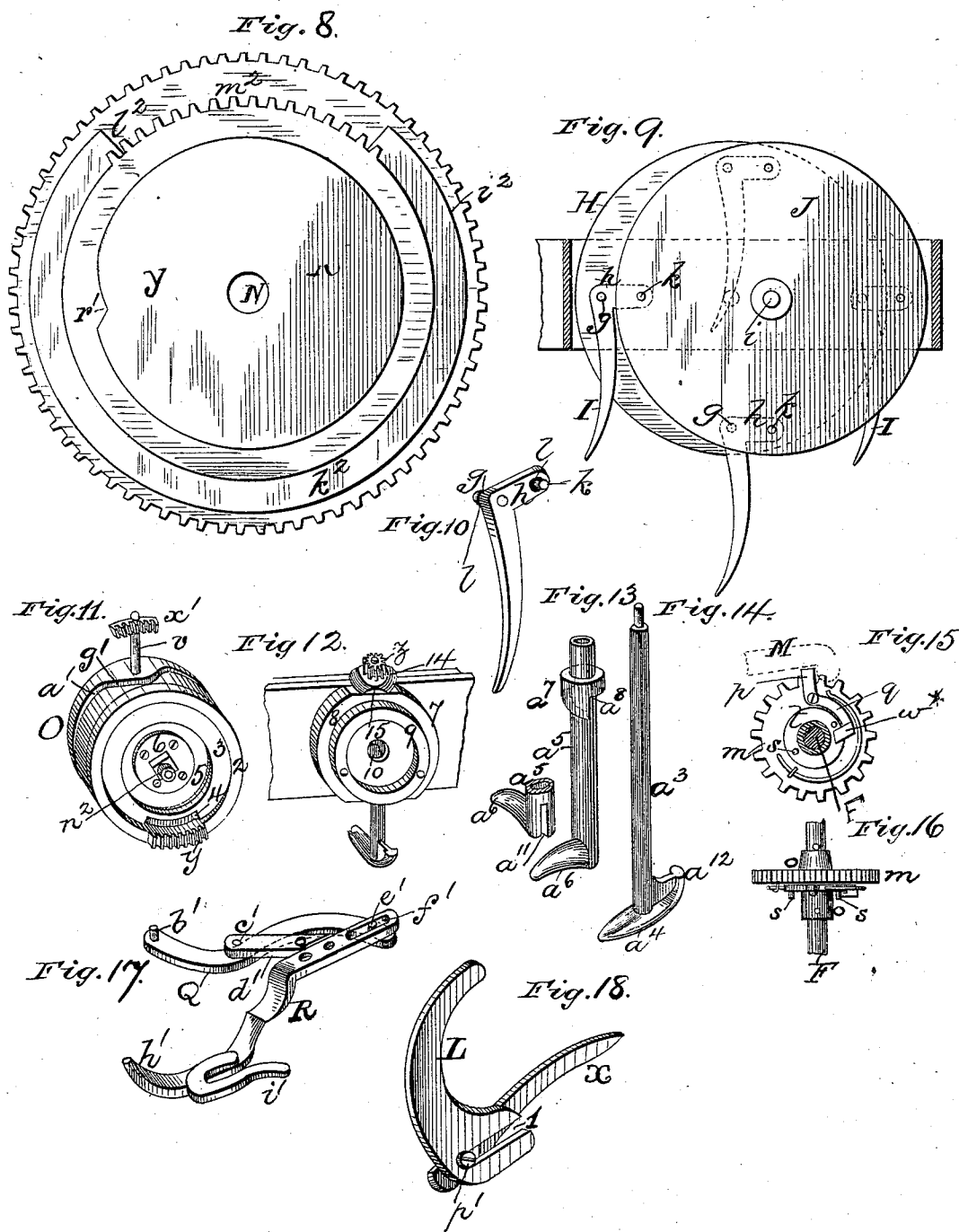
4 Sheets—Sheet 4.

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UNITED STATES PATENT OFFICE.

WILLIAM VAN HORN, OF PIQUA, OHIO.

GRAIN-BINDER.

SPECIFICATION forming part of Letters Patent No. 273,325, dated March 6, 1883.

Application filed April 25, 1882. (Model.)

To all whom it may concern:

Be it known that I, WILLIAM VAN HORN, a citizen of the United States of America, residing at Piqua, in the county of Miami and State of Ohio, have invented certain new and useful Improvements in Grain-Binders, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to that class of grain-binders in which the grain is bound with cord; and it consists in certain peculiarities and improvements therein, as will be hereinafter described and claimed.

In the drawings, Figure 1 represents a perspective view taken from the front, and Fig. 2 a perspective taken from the rear, of a grain-binder constructed according to my improvements. Fig. 3 is a detail view, in elevation, of the rear of the machine, wheel K being removed. Fig. 4 is a top plan view, and Fig. 5 a bottom plan view, of the machine. Fig. 6 represents in sectional elevation the needle with my improvements applied thereto. Fig. 7 represents a perspective view of the sheaf or gavel compressor. Fig. 8 is an elevation of a part of the gearing. Fig. 9 is a front elevation of my improved grain-packer. Fig. 10 represents in perspective one of my packer-arms. Fig. 11 represents in perspective a cam and rack wheel for operating the cord holding and tying mechanism. Fig. 12 represents in elevation the cord-tyer in position in the framing. Figs. 13 and 14 represent the cord-tyer and sleeve separately. Fig. 15 shows in rear elevation, and Fig. 16 in plan view, a portion of the gearing with clutch mechanism. Fig. 17 represents in perspective the cord guiding and throwing arms and knife-operating arms. Fig. 18 represents in perspective the gavel holding or supporting and the gavel-discharging arms. Fig. 19 shows the cord-holding device separately.

A represents the platform or apron upon which the grain is received from the elevator. This platform may be secured in any suitable manner to the elevator-frame, and is slotted, as shown, to admit of the passage therethrough of the needle and its attachments and the gavel-compressor, and also the gavel holding and discharging arms.

Journalled in bearings *a* on the under side of

the platform A is the rock-shaft B. These bearings are secured to the platform by ears *b*, and extend far enough in a downward direction at their center to allow of the gavel holding and discharging arms revolving within the slots in the platform without coming in contact with shaft B.

C represents the cord-spool, which is journaled in bearings *c*, secured to the under side of the platform. From this spool the cord passes to and through the staple *d*, and from thence to staples *e* in the compressor-pushing arm E, to the needle D, which has a longitudinal groove, *a*², in its rear face, to guide the cord and prevent it slipping off the needle-point, and a stop, *a*^x, against which the front end of the U-shaped arm V, to be presently described, impinges, and thereby holds the cord straight in proper position to enter the groove *a*².

F represents the main driving-shaft, which receives its motion through a pulley or cog wheel, *f*, operated by any suitable means.

The packer G, for packing the grain upon the gavel holding or supporting arms, consists of two disks or wheels, one of which, H, is keyed upon the inner end of the shaft F, and has pivoted to its face, at *g*, the arms or extensions *h* of the packer-arms I, the other disk, J, being journaled in the framing at *i*, eccentrically to the disk H, and having the ends of the packer-arms I pivoted at *k* to the inner face of the disk J, as shown. If desired, instead of applying the pivot-pins *g* and *k* directly to the packer-arms, and then securing said pins within holes in the disks, said pins may be first applied to the disks themselves, and the packer-arms then engaged therewith. Again, the arms or extensions *h* of the packer-arms I may be of elbow form, as shown, or they may be of any other desired or convenient contour or shape, and they may extend from said arms in a reverse or in any other suitable direction from said arms. The distance from pivot *g* to pivot *k* is equal to the distance from center to center of the disks or wheels H J. Upon each of the pivot-pins is formed a shoulder, *l*, which projects slightly beyond the arms or extensions, to prevent the binding upon and friction against said disks of said packer-arms. By thus eccentrically mounting the disks H

and J and constructing the upper ends of the packer-arms I with an arm or elbow-extension at their inner ends, and pivoting said arms to each disk, and mounting said disks with an equal distance between their centers and between the pivots g k , I secure a uniformity of action of said arms, and as said disks revolve said arms will retain a vertical or nearly vertical position and will revolve around each other, and on their upward rotation will be brought entirely within the circumference of said disks, thereby insuring the rotation of said arms free from contact with any of the operative parts of the machine.

By pivoting the packer-arms upon the disks or wheels and mounting said disks eccentrically, as shown, considerable leverage power will be imparted to said packer-arms during their rotation forward. This is especially advantageous when they reach the position for operating upon the grain on the platform, as they are held perfectly rigid between the disks, and as they revolve with the disks they press the grain forward to the holding-arms with a steady force.

In the drawings I have shown the binder as provided with one packer only; but by extending the short shaft or pin i one or more additional packers may be mounted thereon whenever it is desired to exert a forward pressure upon the grain at more than one point of its length. Loosely mounted upon the shaft F is a toothed wheel, m , which is held from longitudinal movement upon said shaft by sleeves o , and gears with the teeth of the drive-wheel K, which is keyed upon one end of a shaft, N, upon whose other end is mounted a disk, to be presently described, for operating the tyer-shaft and cord holding and cutting devices.

The gavel-discharging arms X are mounted upon the shaft W. The gavel-supporting arms L are connected at p' to the gavel-discharging arms X, so as to extend in a reverse direction therefrom, the object of which is that, as the gavel-supporting arms L recede and pass downward below the platform on the completion of the tying of the gavel, said arms X will ascend and come in contact with the gavel on its opposite side, and on the continued revolution of said shaft W said arms X will press the gavel forward and off the platform.

Within the lower end of each arm L is formed a slot, 1. By loosening the screws p' said arms can be slid inward or outward, as desired, to adjust their position upon said shaft, and thereby increase or diminish the space between the arms L and the packers, and allow of gavels of larger or smaller circumference being formed, as desired.

Upon the inner face of the drive-wheel K is a cam, Y, the rim of which, as the drive-wheel revolves, is in contact with a pin, q' , on the inner face of the hooked arm M. Upon this disk Y being revolved until the recess r' comes under the pin q' , said pin will drop down within said recess, and thereby bring the hooked outer end of the arm M into engage-

ment with the upper arm of the clutch on the wheel m , and thereby hold all the operative parts of the machine, with the single exception of the packer, from rotation. Upon the grain being packed against the gavel-supporting arms L by the packer-arms, said arms will be forced backward, and as they are securely fastened to the shaft W, said shaft W will thereby be correspondingly turned. The reverse rotation of this shaft W is prevented by a spring-pawl, s' , which engages with a ratchet-wheel, t' , upon said shaft W. Upon the end of this shaft W is keyed a cog-wheel, L, which meshes with a gear-wheel, u' , journaled in the framing. Projecting from the inner face of this gear-wheel u' is a projection, v' , which, as the gear-wheel u' is, through the cog-wheel L, moved around the distance of one tooth, is forced against the downwardly-depending portion w' of the hooked arm M, pushing the same forward, and thereby tripping the hook, as shown in dotted lines, Fig. 3, and by means of a clutch mechanism, to be presently described, coupling the wheel m with the driving-shaft F, in order that said wheel m may rotate and impart motion to the drive-wheel K and parts connected therewith. The horizontal and vertical arms of the hook M have movement within staples g^2 h^2 , which retain the same in proper position.

Projecting outwardly from the outer face of the gear-wheel u' is a pin, f^2 , which rides upon the rim i^2 of the disk k^2 , the office of said pin while riding upon said rim being to hold the gear-wheel, and consequently also hold the toothed wheel Z and the shaft upon which are the gavel supporting and discharging arms, from movement until the recessed or cut-away portion l^2 of the rim i^2 comes opposite said pin f^2 . Then at this moment the cogs of the gear-wheel u' and the teeth of the rack m^2 will mesh together, and as the gear-wheel u' revolves it will turn the toothed wheel Z and cause the shaft W to revolve and operate the gavel supporting and discharging arms. The grain from the elevator falls upon the platform or apron A in front of the packer G, and as the cog-wheel f , which may be a chain-wheel or a band-pulley, or of other suitable construction, and revolved in any of the well-known ways, revolves, the shaft F is caused to revolve and carry with it the inner disk or wheel, H, which in its turn carries around the outer disk or wheel, J, and the packer-arms I, secured to said disks or wheels. As these arms I revolve they take hold of the grain lying upon the apron or platform A and propel it forward toward the gavel-supporting arms L, said forward movement of the grain being continued by the arms I until the pressure of the grain against the gavel-supporting arms L forces them back far enough to raise the hooked arm M from a clutch-arm, p , on the inner face of the gear-wheel m . This arm M is pivoted at its rear end to the framing, and is held down at its free end in locking engagement with the arm p of the clutch g , as shown in Fig. 15, by a plate-

spring, r , which is attached at one end to the framing, its free end projecting outward so as to rest upon the hooked arm M near its forward end and hold it down in engagement with clutch-arm p . When the arm M is raised from engagement with the clutch-arm p the continued revolution of the shaft F will cause a pin, s , (of which there may be several,) on the disk t to engage the lower arm, w^* , of the clutch, and thereby couple the wheel m to the shaft F. Upon the wheel m and shaft F being coupled together, the continued rotation of said shaft will cause said wheel to revolve and impart rotary motion to the drive-wheel K.

On the outer face of the drive-wheel K, and eccentrically thereon, is a stud or projection, b^2 . To this stud b^2 is secured the upper end of a pitman, c^2 , which is composed of two short rods having right- and left screw-threads formed upon their inner ends, said ends being coupled together by a sleeve, d^2 , by turning which in one direction the inner ends of said rods may be brought nearer together, and the pitman thus shortened, and by turning said sleeve in the reverse direction said ends are pushed further apart, and the pitman thereby lengthened. The lower end of this pitman is secured to a crank-arm, e^2 , which is keyed upon the outer end of the rock-shaft B. Upon this rock-shaft B is mounted the needle D.

The compressor T consists of two curved arms, U U, joined together at or near one end by a pin or stud, m' , and at the opposite end by a pin or stud, m^3 . The pin m' preferably has a roller mounted thereon to avoid friction on the needle, and at this end the curved arms of the compressor are pivoted upon a transverse shaft, n' , having bearings within the platform or within slotted plates, o' , attached to the under side thereof. By securing these ends of the arms U U within the slots o^2 , the needle, on passing up, will press against the pin m^3 and push such lower ends forward within the slots, thereby diminishing the space between the compressor and the gavel-holding arms. Upon the retraction of the needle the recessed rear edges m^* of the arms U of the compressor are forced against the shaft B, which causes their pivoted ends to move rearwardly in the slots sufficiently to allow of such arms U passing down beneath the platform without coming in contact with and binding against the shaft B, as would be the case were the arms U pivoted without capability of horizontal movement.

E represents a curved arm, which may be formed solid with the needle-arm or formed separately therefrom and secured at its lower end thereto. This arm has eyes or staples e e , as shown, through which the cord passes from the spool to the groove a^2 and to the eye of the needle, and near its upper end this arm E passes between the cheeks or arms U of the compressor and rests against the rear face of the pin or stud m^3 . The effect of this arrangement is that as the drive-wheel K revolves the shaft B is turned, carrying with it the needle D, and as said needle passes upward and for-

ward the arm E thereon will press against the pin or stud m^3 and force the compressor forward, thereby compressing the grain up to and upon the gavel-supporting arms L, and on the needle being retracted, after the bundling and tying of the gavel are completed, the rearward motion of said needle will cause its arm to press against the front face of the pin or stud m^3 and carry the compressor down with it below the platform A.

Attached to the arm E, or formed solid therewith, with its forward end resting or abutting against a stop at a^{**} , on the rear of the needle-arm, for the purpose hereinbefore described, is a bow or D shaped arm, V, which serves as a guard or fence to hold back the grain from the needle during the operation of compressing and tying the gavel. As the packer is in constant operation, the tendency of its arms is to continuously press forward the grain upon the platform, and without such arm V the grain would be pressed against the needle and compressor, and thereby impede their action and become tangled up with the gavel being bound. By the employment of this arm V the grain upon the platform A is effectually kept back from the needle and compressor and a clear space left within which they can work.

At the same time that wheel K causes the forward motion of the needle it also rotates the shaft N, at whose opposite end is secured a cam and rack wheel, O. On the rim or periphery of this cam and rack wheel O is an arm or pin, v , having segment x' on its outer end, which, when the needle has passed forward so as to place the end of the cord across or between the arms of the cord-holder x by the continued revolution of said cam and rack wheel O, comes in contact with the toothed disk y' and turns the cord-holder x around the distance of one arm, thereby causing the latter to clamp and hold the cord taut until the knot is formed, when the knife S is turned by the arm h' and the cord cut and thrown, in the manner hereinafter described.

Projecting from the outer face of the cam and rack wheel O is a lug or projection, upon which is sleeved a roller, n^2 .

The cord-tyer P consists of a shaft, a^3 , having a finger, a^4 , and a sleeve, a^5 , having a finger, a^6 . Upon the sleeve a^5 is formed a cam, a^7 , which, when the tyer is rotated to form the knot by the segment on the cam and rack wheel O engaging with the cog-wheel on the tyer-shaft, rides upon said roller. The sleeve and its finger a^6 are thereby raised to admit the entrance between the fingers a^4 and a^6 of that part of the cord at the rear of the knot, and when the offset a^8 on the cam a^7 is in line with the roller n^2 the free end of the spring a^9 , which rests upon the top of said cam, will force the sleeve down, and thereby clamp the cord between the two fingers. This spring is secured at its rear end by a screw, a^{10} , to the framing D', and by clamping this spring in different positions its action upon the cam may be regulated and the pressure upon the cam of

said spring increased or diminished as it is desired to force the sleeve down more or less quickly and firmly.

The object of arranging a roller for the cam a^7 to travel upon is that thereby the tyer may rotate with greater ease and less friction than would be the case were said cam arranged to ride upon a pin or stud on which there was no roller.

In the rear lower end of the tyer-sleeve is formed a vertical slot, a^{11} , within which (when the tyer-shaft is inserted within said sleeve) rests the horn or projection a^{12} . By this arrangement the shaft and sleeve of the tyer are coupled together, so they shall rotate together, while yet allowing the sleeve free and independent vertical movement upon said shaft.

Upon the inner edge of the wheel O is a segmental rack, y , which is so arranged upon said wheel that it shall gear with the teeth upon the pinion or toothed wheel z on the top of the tyer-shaft at the time that the segment on the pin v on the wheel O operates upon the cord-holder. The teeth on the segment y are of a number sufficient to revolve the cog-wheel z once. As the cog-wheel z revolves it carries the shaft of the tyer P.

A cam-groove, a' , is formed in the circumference of the wheel O, within which works a pin, b' , on one end of an arm, Q. This arm Q is centrally pivoted at e' to a link, d' , connecting said arm Q with arm R, and has a pivot or pin, e' , which rests within the slot f' in the arm R. By this construction, upon the revolution of the wheel O bringing the pin b' into engagement with the inclined portion g' of the cam-groove in the wheel O, the arm Q will draw the slotted end of the arm R inward, and consequently force the front end, h' , of the arm R and the hook-shaped end i' outward. As the end h' moves outward it comes in contact with the lug j on the knife S and pushes said knife partly around, so that the sharp edge k' of said knife shall cut with a shearing action against the frame on which it is mounted, and thus sever that portion of the cord lying across the edge of the frame and allow of the removal of the tied gavel. As the needle begins its return movement the end h' of the arm R returns to its normal position, and as it returns it comes in contact with the lug l' on the knife S and pushes said knife back in readiness for the next cutting movement. The hook-shaped end i' on the arm R pushes the cord away after the tying operation.

In Fig. 11 is shown a perspective view of the cam and rack wheel O, with a part removed to show its internal construction. The inner face of this wheel has an outer circumferential rim, 2, and inner circumferential flat face, 3, recessed at 4, a central recessed portion, 5, and a disk, 6, for holding said wheel upon its shaft.

In Fig. 12, 7 represents a plate or disk, which is secured to the framing and fits within or upon the face of the wheel O, (shown in Fig. 11.) On this plate 7 is a flat face, 8, with which the flat face 3 comes in contact and upon which it

revolves. 9 represents a central rim which fits within the recess 5. 10 represents a circular orifice through which the roller w^2 upon the shaft projects to engage with the cam on the sleeve of the tyer. The opposite face of this plate 7 is recessed to receive the tyer, which is embraced on the opposite side by offsets 11 on the plate 12. A recess, 13, is formed in this plate to permit of the free end of the spring a^9 engaging the cam on the tyer-sleeve. Resting upon the top of this plate 12, and extending across the rim of the plate 7, which is cut away at that point, as shown, to allow of the free movement thereof, is a disk, 14, which is mounted on the tyer-shaft and revolves therewith. This disk 14 is cut away or flattened at 15. Upon this plate 7 being secured to the face of the wheel O, this flattened portion 15 will rest against the flat face 3, and, on said wheel O revolving, said face 3 will travel continuously across this flattened portion until the segment on the wheel engages with the cog-wheel on the tyer-shaft. Immediately on the segment turning the cog or pinion on the tyer-shaft, said disk or collar 14 will revolve, and the circular portion of its rim or edge will then come opposite to the recess 4 in the face of the wheel O, and thereby admit of the tyer freely revolving until the flattened portion 15 again comes in contact with the flat face 3 of the wheel O.

Attached to the rear end of the framing are two plates, $b^3 b^3$. To the inner face of each plate is secured one end of a plate-spring, b^4 , with its free end extending down toward the lower ends of said plates. The cord holder or wheel x is pivoted within the lower ends of these plates b^3 , so that its arms w may revolve vertically between the free ends of the springs b^4 . Upon the needle with cord threaded thereon advancing, the forward portion of said cord will pass across and rest upon said wheel within the space between the arms that is then in alignment with the needle. Then as the wheel O revolves the segment x' on the end of the arm of pin v will engage with the teeth of the disk y on the wheel x , and thereby turn said wheel x around sufficiently to cause the arms w to move forward and carry the cord to and between the free ends of the springs b^4 , which will then clamp the cord and hold the same firmly between them and the arm holding the cord. The binding or clamping power of said springs b^4 upon said cord, and also upon the wheel x , can be regulated by a binding-screw, b^7 , by tightening which the plates b^3 can be forced nearer together to grip the cord and wheel more firmly, or by loosening said screw b^7 the friction upon such cord and wheel can be diminished, as occasion may require.

Upon the rear face of the outer plate, b^3 , are a spring-pawl and ratchet, b^8 , said ratchet being keyed to the outer end of the shaft or pivot upon which the wheel x rotates, for the purpose of preventing rearward motion of said wheel x , which is very necessary, as without some such arrangement said wheel might be forced backward, and thereby cause the pre-

mature release of the cord held thereby, and thus entangle the cord and cause a derangement of some of the operative parts of the machine.

5 The knife S is pivoted to the outer face of the inner plate, b^3 , by a screw, b^9 . A friction-spring may be placed under the head of said screw, so as to insure the knife being held steadily in whichever position it is turned.

10 This knife has a circular rear edge to allow of the cord readily slipping around or across the same on its passage to the cord-holding wheel. A' represents a plate or shield, attached at each end to suitable hangers on or otherwise

15 secured to the framing, for the purpose of fending or shielding the tying mechanism from grain. A longitudinal slot, B', is formed in said plate or shield to admit of the passage therethrough of the needle-arm and its attach-
20 ments.

C', Fig. 2, represents a bow-shaped arm, which is secured at one end to the edge of the platform A and at its outer end to the under side thereof. As the gavel is pushed off
25 by the arms X it will drop upon this arm C' and fall away from the line of movement of said arms X.

The operation of the machine is as follows: The needle D having been threaded, the pulley
30 or wheel f is connected to the ordinary driving mechanism, and on motion therefrom being imparted to said wheel or pulley the shaft F will revolve and carry with it the wheel m , and cause the same to revolve the drive-wheel K.

35 By means of the pitman c^2 motion is then imparted to the rock-shaft B, upon which the needle D is mounted. As this shaft B rocks it carries the needle up and forward until the loose end of the cord is laid across the cord-
40 holding wheel. As the wheel O revolves the segment on the pin engages with the teeth on the cord-holding disk or wheel x and turns the same around, thereby carrying the cord between the cord-clamping plates b^4 b^4 , where it
45 is tightly held. The continued revolution of the drive-wheel will then cause the retraction of the needle below the platform. Said drive-wheel then continues its revolution until the recess r' comes opposite the pin q' , when said
50 pin q' will drop down into such recessed portion r' and cause the hooked arm M to engage with the arm p on the clutch, and thereby hold the coupling-wheel m , and consequently drive-wheel K and parts connected
55 therewith, from rotation. The cord being thus placed in position, the grain is then allowed to fall upon the platform A from the elevator in front of the needle, and as the packer G revolves the arms I press such grain forward and pack it upon the gavel-supporting arms L. As the grain packs against the gavel-supporting
60 arms L said arms will be slightly pressed back. This will cause the shaft to turn partly around and move the wheel t' one tooth. As wheel t' moves around the distance of one tooth
65 it causes the gear-wheel w' to move the distance of one tooth also, and thereby bring the pin on

its outer face into frictional contact with the rim i^2 , and at the same time causes the pin f^2
on the opposite side of said wheel w' to press 70 against the lower end of the arm M, and thereby raise the hooked end of said arm and release the clutch. The clutch having thus been released, the wheel m revolves and im-
75 parts motion to the drive-wheel K, which in turn rotates the shaft upon which the cam and rack wheel O is mounted and operates the rock-shaft B, carrying the needle-arm and its
80 attachments. As the shaft revolves the needle ascends and carries forward the compressor, which compresses the grain, places the cord
85 across the fingers of the tyer, and presents the forward portion of the threaded cord to the arms w . At the same time the segment on the arm v engages with the cog-wheel on the
90 disk x and causes the arms w to move around one step to grasp the cord. While this operation is being effected the segment on the
95 wheel O engages with the cog-wheel or pinion on the top of the tyer-shaft and causes the tyer to rotate and knot the cord. As the tyer rotates, the cam upon the tyer-sleeve comes in
100 contact with the roller projecting from the wheel O, and rides upward thereon, thereby opening the respective fingers on the tyer-shaft and sleeve, and allowing them as they
105 revolve to pass on either side of the cord. The tyer having made one complete revolution, the sleeve drops down, being aided in such
110 downward movement by the spring pressing upon the top edge of the cam on said sleeve, and holds the cord between the two fingers. The cam-groove in the wheel O then operates
115 on the arm R and pushes the finger at the front end, h' , against the lug or projection on the knife, thereby causing said knife S to turn and cut the cord. The continued outward
movement of the front end of the arm R then causes the hook i' to push the cord away and free it from the tyer-hooks. Then, as the drive-
120 wheel continues its rotation, the arm R is returned to its position of rest, the needle and compressor are retracted, the shaft W is rotated, and the gavel-supporting and gavel-dis-
charging arms are revolved, and the bound
125 gavel pushed off the platform.

Having thus described my invention, what I claim therein is—

1. The packer G, consisting of the disk or wheel H, keyed upon the inner end of shaft F, 120 the disk or wheel J, journaled in the framing at i , eccentrically to the disk or wheel H, and the packer-arms I, pivoted to the inner faces of said disks or wheels, the distance between the pivots g k being equal to the distance from 125 center to center of the disks G H, substantially as set forth.

2. The packer G, consisting of the disks H and J, eccentrically mounted relatively to each other, and the arms I, mounted between and 130 pivoted to the disks H and J, substantially as described, to insure the points or ends of said arms I always pointing in the same parallel direction throughout their revolutions, in com-

combination with the gavel-supporting arms L, mounted upon the rotary shaft W, and having a motion concentric with said shaft, substantially as described, and for the purpose set forth.

3. A gavel-compressor pivotally mounted at one end in a horizontal slot or slots to admit of said compressor sliding horizontally within the framing, substantially as and for the purpose set forth.

4. The compressor T, having cheeks or arms U, connected by pins or rollers $m' m^3$, in combination with an arm or arms for guiding and assisting said compressor during its forward and rearward motions.

5. The compressor T, having cheeks or arms U and pins or rollers $m' m^3$, in combination with the needle D and the arm E, substantially as and for the purpose set forth.

6. The combination, with the shaft W, of the gavel-supporting arms L, rigidly held upon said shaft with capability of horizontal adjustment, and the compressor T, journaled in horizontally-slotted bearings, and having pins $m' m^3$, substantially as and for the purpose set forth.

7. The combination, with the needle D, having stop a^* , and the arm E, of the bow-shaped arm V, secured at one end to said arm E, its opposite end resting against said stop a^* , as and for the purpose set forth.

8. In combination with the gavel-receptacle, the gavel-supporting arms L, mounted upon and having a motion concentric with the shaft W—first backward a short distance to operate the tripping device, then standing stationary to support the gavel while being bound, then backward throughout its circle to admit of the discharge of the sheaf or gavel and to bring the arm back to its original position—the wheel t' , the wheel u' , with pin f^2 , and the rim i^2 , substantially as and for the purpose set forth.

9. The combination, with the coupling-disk mounted upon shaft F, of the clutch q , having a hooked lower arm and a straight upper arm, the hooked lower arm operating with the coupling-disk to couple the wheel m to the shaft F, and the straight arm operating with the hooked tripping-arm M to raise the hooked lower arm from contact with the coupling-disk, thereby uncoupling the wheel m from the shaft F, substantially as and for the purpose set forth.

10. The supporting-arm L, in combination with the rotary shaft W, the wheel t' , the wheel u' , the hooked arm M, and clutch q , substantially as and for the purpose set forth.

11. In combination with the gavel supporting arms L, the shaft W, gear-wheel t' , and the gear-wheel u' , having pin f^2 , to ride upon the rim i^2 of the wheel K during a part of the revolution of said wheel, substantially as and for the purpose specified.

12. In combination with the gavel-discharging arms X, the shaft W, cog-wheel t' , gear-wheel u' , and cog-rack l^2 , substantially as and for the purpose specified.

13. The combination, with the gavel-discharging arms X, of the gavel-shedder C' , consisting of a bow-shaped arm, secured at one end to the edge of the platform and at its other end to the under side thereof, substantially as set forth.

14. In combination with the gavel-receptacle, the gavel-supporting arms L, mounted upon and having a rotary motion concentric with the shaft W, and means for operating said arms, first for a short distance in the circle to operate the tripping device, and secondly through the remaining part of the circle, moving away from the bound gavel and around to its original position, substantially as and for the purpose specified.

15. The gavel-supporting arms L, mounted upon and having a rotary motion concentric with the shaft W, in combination with the wheel t' , the wheel u' , having tripping-pin v' , the hooked tripping-arm M, the clutch q , pivoted upon the wheel m , and the fixed coupling-disk t upon the shaft F, substantially as set forth.

16. The combination of coupling-wheel m , loosely mounted upon shaft F, the clutch q , pivoted to said coupling-wheel m , the hooked arm M, pivoted to the binder-frame, for engaging with clutch q at the proper time to uncouple the wheel m from the shaft F, and the cam Y on wheel K, substantially as and for the purpose specified.

17. The combination of the wheel m , having clutch q , hooked arm M, having pin q' , spring r , drive-wheel K, having rim i^2 and cog-rack l^2 and cam Y, the gear-wheel u' , having pin for tripping the arm M, pin f^2 , arranged to ride upon the drive-wheel during a part of its revolution, and the cog-wheel t' and shaft W, substantially as and for the purpose set forth.

18. The combination, with the disk t upon shaft F, and having pins s to engage with clutch q , whereby wheel m is coupled to shaft F and revolves the drive-wheel K, the clutch q , pivoted upon the wheel m , the hooked arm M, pivoted upon the binder-frame and having pin q' , the cam Y, and the gear-wheel u' , having pin for tripping the arm M, substantially as and for the purpose specified.

19. In combination with the fixed disk t , mounted upon shaft F, and having pins s to engage with the lower end of clutch q , the clutch q , pivoted to the coupling-wheel m , which is loosely mounted upon the shaft F, substantially as and for the purpose specified.

20. The combination of the cord-holding disk or wheel x , having a plurality of arms, w , and a toothed wheel or pinion, y' , with an arm or pin, v , upon the rim or periphery of the cam, and rack-wheel O, having segment x' , adapted to engage with said wheel or pinion y' and rotate the armed wheel x , substantially as and for the purpose set forth.

21. The combination, with the cord grasping and holding disk or wheel x , of the cord-clamping device, consisting of plates b^3 and

springs b^4 , screw b^7 , and spring pawl and ratchet b^8 , constructed and arranged substantially as and for the purpose set forth.

22. The knife S, having lugs or projections j and l' , in combination with a finger or arm, h' , on the cord-stripping arm R, adapted to enter between said lugs and push said knife across the cord and then retract the same, substantially as set forth.

23. The combination, with the wheel O, of the arm R, having engagement at one end with cam-groove in said wheel, and provided with a knife-operating finger and a cord-pushing hook, substantially as and for the purpose set forth.

24. The combination of tyer-shaft a^3 , having toothed wheel z and collar 14, and the wheel O, constructed substantially as described, and having recess 4 and rack y , substantially as and for the purpose set forth.

25. A cord-tyer having a sleeve, a^5 , provided with a vertical slot, a^{11} , and a shaft, a^3 , having horn or projection a^{12} , substantially as and for the purpose set forth.

26. The combination of the cord-tyer herein described, consisting of shaft a^3 , having finger a^4 , sleeve a^5 , having finger a^6 , and cam a^7 , having offset a^8 , the spring a^9 , and a roller or pin projecting from the wheel O, substantially as and for the purpose set forth.

27. The combination of the needle D, cord-tyer P, wheel or disk x , knife S, and arm R, having a finger to operate the knife, substantially as and for the purpose set forth.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM VAN HORN.

Witnesses:

CHAS. J. GOOCH,
GEO. F. GRAHAM.