

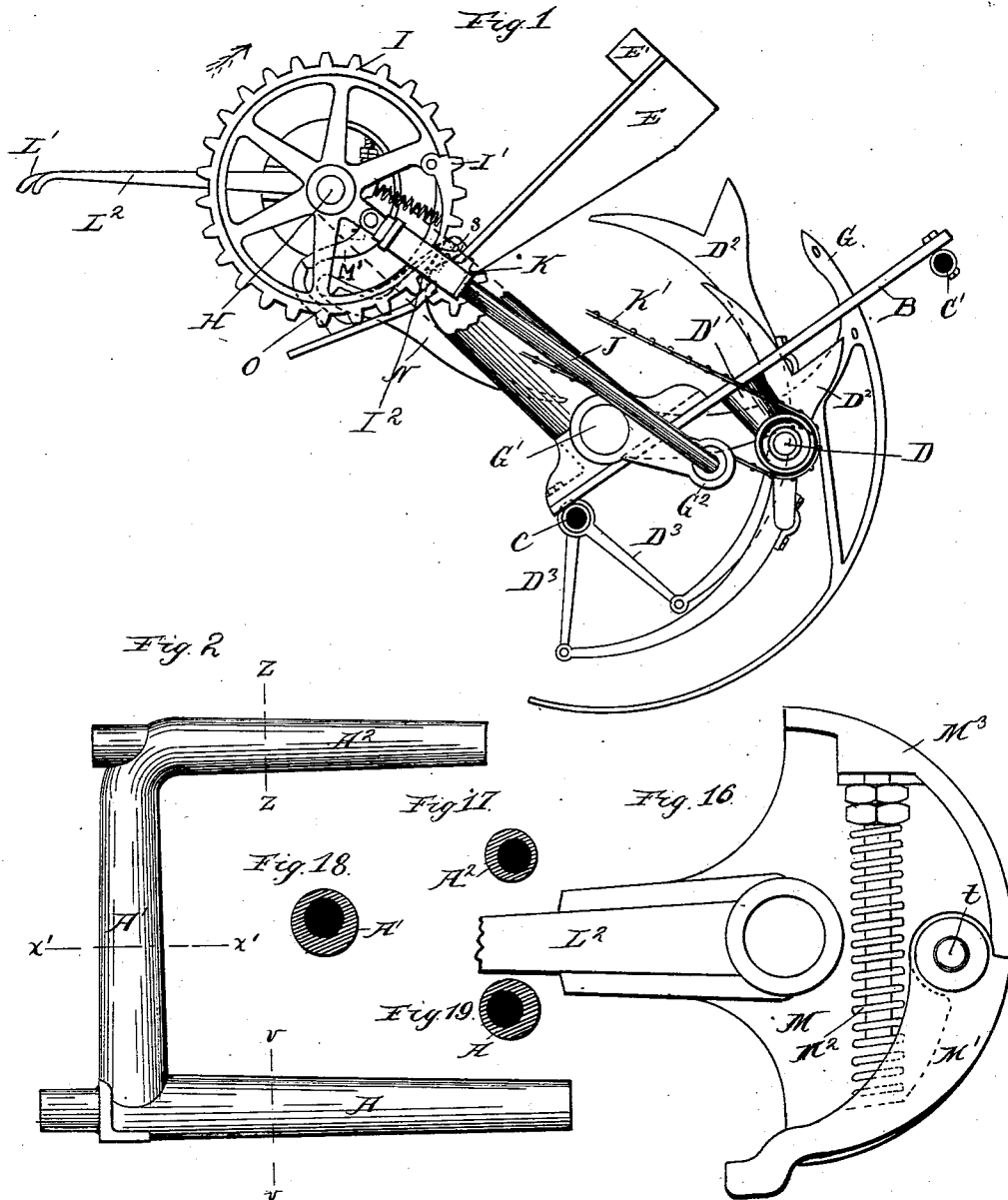
(No Model.)

4 Sheets—Sheet 1.

W. W. BURSON.
GRAIN BINDER.

No. 564,589.

Patented July 28, 1896.



Witnesses:

Sew. C. Curtis.
Geo. M. Hopper

Inventor:

William North Burson.

(No Model.)

4 Sheets—Sheet 2.

W. W. BURSON.
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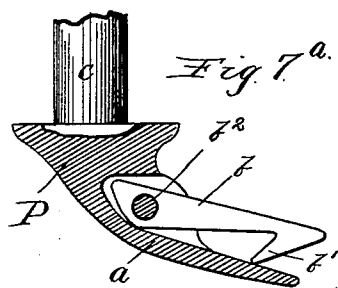


Fig. 20.

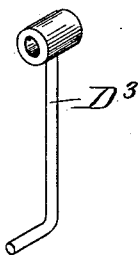
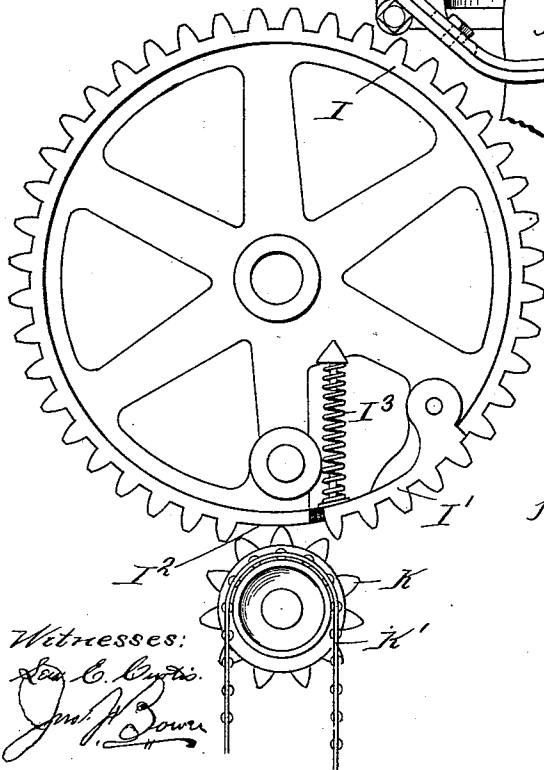


Fig. 1a.



Witnesses:
Geo. C. Lytle.
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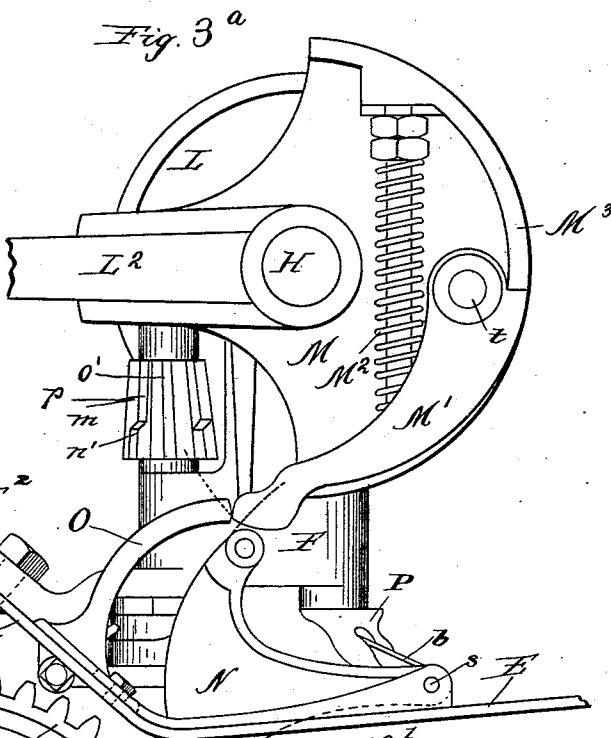
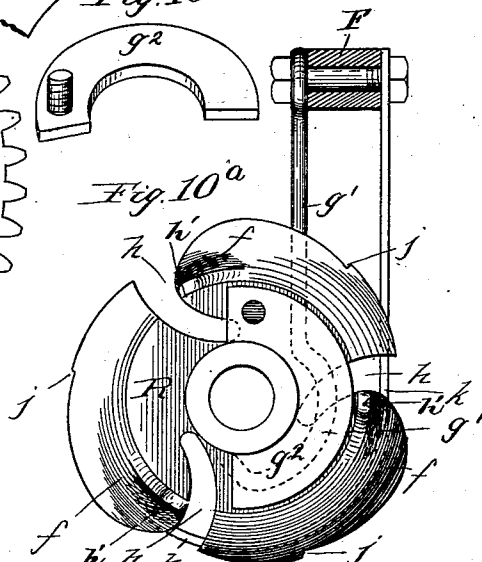


Fig. 10b.



Inventor:

William Worth Burson.

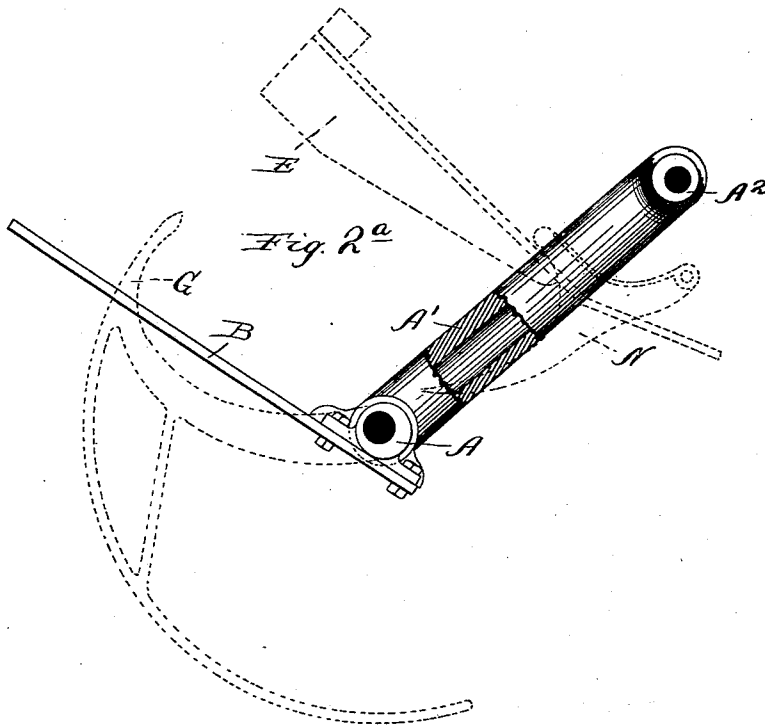
(No Model.)

W. W. BURSON.
GRAIN BINDER.

4 Sheets—Sheet 3.

No. 564,589.

Patented July 28, 1896.



Witnesses:
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H. M. Munday.

Inventor:
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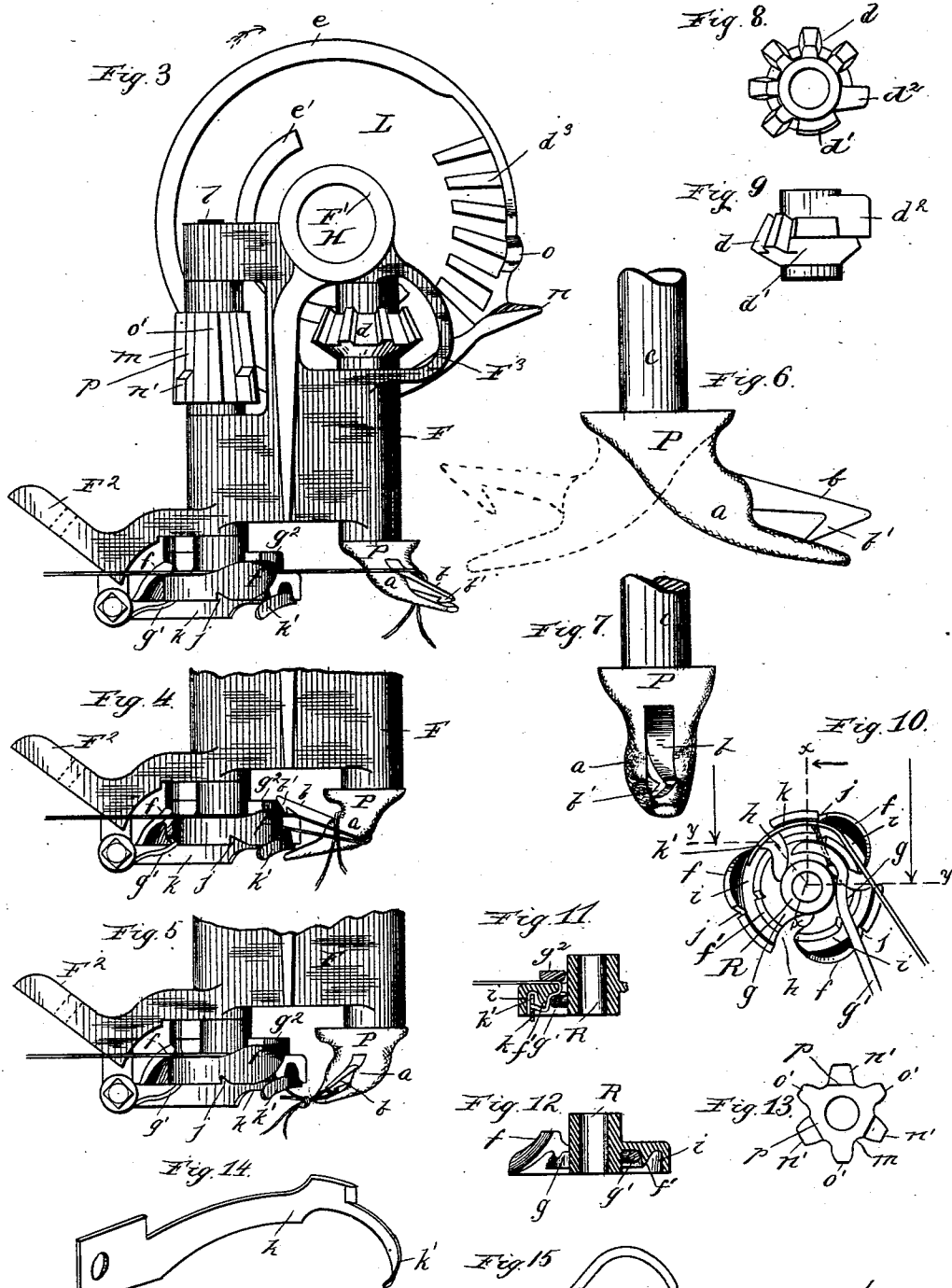
(No Model.)

4 Sheets—Sheet 4.

W. W. BURSON.
GRAIN BINDER.

No. 564,589.

Patented July 28, 1896.



Witnesses:
 Geo. C. Curtis.
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Fig. 1 Inventor:
William North Burser

UNITED STATES PATENT OFFICE.

WILLIAM WORTH BURSON, OF CHICAGO, ILLINOIS.

GRAIN-BINDER.

SPECIFICATION forming part of Letters Patent No. 564,589, dated July 28, 1896.

Application filed April 16, 1888. Serial No. 270,816. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM WORTH BURSON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Grain-Binders, of which the following is a specification.

My invention relates to that class of grain-binders which use twine or cord for a band material and are attached to a harvester; and the objects of my invention are, first, to make a stronger binder-frame without increase of material than has heretofore been made; second, to simplify and improve the construction of the tripping and compressing mechanism; third, to improve the "paying-out" mechanism now in use in knotting devices; fourth, to provide means for drawing the knot tight and at the proper time release it; fifth, to provide an improved cord-holding mechanism, and in general to simplify and improve the efficiency of the grain-binder. I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is an end view of the binder, certain parts being removed the better to show others. Fig. 2 shows the binder-frame. Fig. 3 shows the knotter-frame and knotting mechanism. Figs. 4 and 5 illustrate movements of the knotting mechanism. Figs. 6 and 7 show the knotting-hook. Figs. 8 and 9 show knotter-pinion *d*. Fig. 10 shows the cord-holder R, viewed from the under side. Fig. 11 shows a section of Fig. 10 on the line X X. Fig. 12 shows a section of Fig. 10 on line Y Y. Fig. 13 shows pinion *m*. Fig. 14 shows the knife *k*. Fig. 15 shows the stationary cord-holder piece *g'*. Fig. 16 shows discharge-arm hub and attachments. Fig. 17 shows section of binder-frame on line Z Z. Fig. 18 shows section of binder-frame on line X' X'. Fig. 19 shows section of binder-frame on line V V of Fig. 2. Fig. 1^a shows gear-wheel I and pinion K. Fig. 3^a shows discharge-arm hub M and contiguous parts. Fig. 7^a shows knotter-hook P in section. Fig. 10^a shows a top view of the cord-holder. Fig. 10^b shows holder *g*². Fig. 2^a shows link D³. Fig. 20 is an elevation of the binder-frame, showing its elements A, A', and A² in section and the needle G and trip N in dotted lines.

Similar letters refer to similar parts throughout the several views.

The relation of the grain-binder to the harvester is so well understood that I do not think it necessary to explain it here, but will for the purposes of my present description assume that the binder is properly attached to the harvester, so that the cut grain shall be brought within reach of the binder-packers and proper motion given to the binder by connection with the harvester-gearing.

In the drawings, A is the lower arm of the binder-frame, A' the upright part, and A² the upper arm, which furnishes bearings for the knotter-shaft. For the purposes of this description I shall speak of the binder-frame as A where it is referred to as an entirety, without regard to its members.

The binder-frame A is fastened to the bars B, (only one shown here,) which are fastened to the pipes C C'. The packer-shaft D is supported in hangers D', depending from the underside of frame-piece B, and the packers D² are operated by cranks on the packer-shaft, as is well understood. The lower ends of the packers are supported by the swinging links D³ D³, pivotally suspended on pipe C, Fig. 1. The breastplate E is supported at its upper end by the spring rail E', the usual construction, and at its lower end by the knotter-frame F, Fig. 3^a. The needle G is supported upon needle-shaft G', which has bearings in frame A. On the end of the shaft G' opposite the needle is the crank G². The knotter-shaft H in binder-frame arm A² supports the knotter-frame F and at the other end gear I. This gear has the hinged segment I', adapted to yield when engaging with the driving-pinion to avoid locking, and also has the mutilated part I². The pitman J connects the crank G² with the wrist-pin in gear I, (not here shown,) and gives the usual reciprocating rocking motion to the needle G by the revolution of said gear. Gear I is conveniently driven by pinion K, connected with the packer-shaft by the chain K', Fig. 1.

The discharge-arm L' is conveniently fastened upon gear L, the usual construction, and the discharge-arm L² is fastened upon hub M, which is secured to the shaft H on the side of the knotter opposite the knotter-operating wheel L. Latch M' is hinged to an extension

of hub M at *t*, and is held supported in its operating position by the spring M². This latch and the flange M³, upon hub M, form the resistant for the trip and compress N against the pressure of the grain. The trip and compress N is pivoted to the breastplate E at *s*. The stop O is fastened adjustably to the breastplate, Figs. 1, 3^a.

The pressure of the gavel upon the trip N, projecting below the breastplate, raises its upper end (shown in Figs. 1 and 3^a as resting against the cam-shaped end of latch M') and lifts it above contact with stop O, when the continued pressure of the grain upon the trip turnshaft H by means of the cam-shaped end of said latch M'. This rotation of shaft H brings segment I' of wheel I into engagement with the constantly-moving driving-pinion K, which turns shaft H one revolution and brings the latch M' and flange M³ as a resistant successively in contact with the upper end of the trip N, thereby holding said trip firmly against said pressure until said latch and flange have passed the end of the trip, when the latter may swing freely backward and permit the discharge of the bound sheaf.

The knotter-frame F, Fig. 3, has the sleeve F' at its upper end, which fits loosely on the shaft H and is supported thereon, and the foot F², by which it is fastened to the breastplate E. The knotter-frame F furnishes a bearing for the shaft *c* of knotting-hook P, as also for shaft *l* of the cord-holder R, and the guard F³ for pinion *d*, operating knotter P.

The knotting-hook P consists of a rigid jaw *a*, to which is hinged the hooked jaw *b*. The hinged jaw *b* has upon its fore end a barb which is hooked radially inward so as to positively hold the looped ends of the band in the knot when drawn out radially, but it is beveled or inclined sidewise so as readily to release the loop when drawn backward from the axial motion of the knotter, Fig. 4, and is supported upon a shaft *c*. Upon this shaft is the pinion *d*, with its delay-surface *d'* and guide-tooth *d*². This pinion meshes in the segment *d*³ of gear L, and is held at rest by the outer delay-surface *e* acting upon delay *d'* and inner delay-track *c'* acting upon guide-tooth *d*², Figs. 3, 8, and 9.

The cord-holding mechanism consists of a movable and stationary part. The movable cord-holder shell or disk R is turned one-third of a revolution for each knot, hence its operating parts require to be in triplicate. The disk R is formed of inverted-cup shape, with two circular grooves on its under side, one exterior to the other. The hub forms the inner wall and an annular flange *f'*, intermediate between the hub and the outer flange *f* of the disk R, forms the outer wall of the groove *g*, within which the stationary cord-clamping piece *g'* lies; within the outer groove *i*, having the intermediate flange *f'* and outer flange *f* for its walls, the knife *k* is placed. The disk is divided into three parts by the curved openings *h*, extending from its outer

periphery to the hub. The outer flange *f* of the inverted cup or disk is inclined upward toward the hub and serves to lift the pivoted jaw *b* of the knotter over the strands of twine to be drawn through the loop to form the knot. The forward top surface of each of the three parts of the holder-disk is raised to form a hook or guide *h'* to force the cord-strands down into the openings *h*, to be clamped in groove *g* by the stationary piece *g'* and to be cut in the groove *i* by the knife *k*. Intermediate between the openings *h* the flanges *f* and *f'* have the notches *j'*, which engage the cord and force it against the cutting-edge of the knife by the revolution of the shell or disk held on shaft *l*, which is supported in bearings in knotter-frame F parallel to shaft *c*. The pinion *m* upon shaft *l* gives movement to the disk by the action of starting-tooth *n* and tooth *o* of gear L upon tooth *n'* and *o'* of the pinion, and is held at rest by the delay-surface *p* moving upon delay-flange *e* of gear L.

The stationary part of the cord-holder consists of a piece *g'*, bolted at one end to the knotter-frame and bent at its opposite end to enter and partially conform to the shape of groove *g* in the disk R, and forms with said groove a grip to hold the end of the twine. For additional safety in holding the end of the twine and to form a paying-out friction upon the end of the twine after piece *g'* has released its hold upon the same, the curved piece *g*² is placed above the disk R. One end of piece *g*² is fastened to the knotter-frame, the other is curved to fit a flattened surface on the said disk, and has its forward end beveled or bent so that the revolution of the said disk shall draw the twine between said flattened surface of the disk and the said piece *g*².

The knife *k* is bolted at one end to the knotter-frame and has its other end bent so as to conform to groove *i* on the under side of disk R. It has upon its fore end a cutting-edge, and has the extension-piece *k'* projecting beyond the cutting-edge, which is adapted to insure the guiding of the twine against the cutting-edge. The twine resting in the notches *j* of disk R is brought against the cutting-edge of the knife by the revolution of the said disk.

It will be readily seen that the stationary part of the cord-holder, as also the knife, may be placed on the upper side of the disk, instead of the under side, as here shown. In some forms of construction this might be desirable.

Having briefly described my machine, I wish to ask attention to a few points of construction herein shown.

In outward appearance my binder-frame does not differ materially from others. The different parts are cylindrical and cored hollow, but the core, instead of being placed central, as is usually done, is placed eccentric in each of the three members of the frame, so that the greater amount of metal is placed on that side of the part which is to receive

the heaviest strain. Actual breaking tests have demonstrated that this arrangement gives greatly-increased strength without an increase of metal. The arm A requires the greatest amount of metal on the side opposite the needle or farthest from the harvester, while the upright part of the frame A' and of arm A² should have the greatest amount of metal on the side of the frame next to the harvester, which is the side which receives the greatest strain by the compression of the gavel in binding the sheaf. The metal gets this proper arrangement by placing the core eccentric in these different members. I find it advantageous to make the change under certain constructions of the binder.

The swinging links D³ D³, supporting the lower end of the packers, are made to clasp the pipe C of the binder. These links are usually supported on studs fastened to parts of the frame, which construction involves more expense and is less strong and durable than that herein shown.

In operation, my binder is placed upon the harvester in the usual manner, which does not require special explanation here. Assuming that the binder is properly threaded and ready for work, the operation is as follows: The driving-pinion K, coupled with the packer-shaft by chain K', is constantly running, but so long as it turns in the mutilation I² of gear I does not operate to move the binder. When an agreed-upon amount of grain has been brought against the trip N, the pressure of the grain, by the action of the packers, raises the rear end of said trip, which, pressing against the latch M', raises it above its contact with stop O, and on account of the cam-shaped form of the face of latch M', shaft H is turned by the pressure of said trip in the direction of the arrows, Figs. 1 and 3, whereby segment I' is brought into engagement with the driving-pinion K, which turns gear I, and with it the cam and gear wheel L, on the same shaft. The needle is brought up by pitman J, and at the proper time, as agreed upon, segment d³ of the cam and gear wheel L engages with pinion d and turns the knotting-hook P, which has already received both ends of the band which is to be tied around the sheaf. At the beginning of the movement of the knotting-hook it is in the position shown in Figs. 3 and 6, full lines, and when it has turned half around it is in the condition shown in Figs. 4 and 6, dotted lines. Owing to the eccentric placing of the shaft c in the knotting-hook P, this half-turn of the knotter carries it near enough to the cord-holder to relieve the strain upon the held end of the twine consequent upon the formation of the loop on the knotting-hook and operates as a paying-out device. When in the rotation of the knotting-hook it meets the holding-disk, the beveled flange f raises the hinged jaw b, Fig. 4, and causes it to cross over the ends of the band. At the proper time in the tying

process disk R is turned by the action of tooth n of gear L acting on tooth n' of pinion m, which turns the disk toward the knotter, thereby carrying the ends of the cord into the jaws of the knotter-hook. Tooth o of gear L, acting upon tooth o' of pinion m, completes the movement of the cord-holder, and it is held in position of rest by the delay-surface p of pinion m moving upon delay e of gear L, Figs. 3 and 13. The movement of the cord-holder just described causes the hook on the upper surface of the disk R to engage the twine extending over the knotting-hook and back toward the end of the needle, Figs. 3 and 4, and passes it through the opening h from the upper end to the lower side of disk R, where the twine is engaged in the notches j and brought against the knife k, having first been forced between the groove in the disk R and clamp g', Fig. 11, by which it is securely grasped when it is carried by the notches j against the sharp edge of the knife, to be severed thereby, permitting the cut strands to be drawn through the loop on the knotting-hook to form the knot, which is cast off the knotting-hook as the sheaf is discharged. At the time in the movement of the knotting mechanism when the twine is cut the knotting-hook is in position to shed the knot from the tying-bill, in which position the shape of jaw b' is such that the bow of the knot will be retained by it, insuring the knot to be drawn tight. At the proper time for discharging the sheaf guide-tooth d² of pinion d comes in contact with delay-rib e', by which the knotter is brought into position shown in Figs. 5 and 7, when the bevel shape of hook b', heretofore described, readily releases the bow and the sheaf is discharged. The guard k' on the knife, Figs. 3 and 14, insures the twine being held in the notches j and hence being cut at the proper time.

The frame F is recessed where the pinions d and m are placed, and the shafts having bearings at both ends of the pinions insures great strength and smooth running of said parts.

The guard F³, Fig. 3, serves the double purpose of protecting pinion d from straws, &c., and of strengthening the knotter-frame.

Various modifications and changes can be made in the foregoing-described devices without removing them from the scope of my invention.

What I claim as my invention is—

1. In a grain-binder, a binder-frame cast integral formed of two parallel hollow cylindrical arms A and A², and a connecting part A' cast hollow and cylindrical, the arm A formed with more metal on the side opposite the needle than on the side nearest to the needle, whereby said arm is the better adapted to withstand the strain of compressing the gavel, substantially as set forth.

2. In a grain-binder, a binder-frame cast integral, formed of two parallel hollow cylindrical arms A and A², and a connecting part

A' cast hollow and cylindrical, said part A' formed on the needle side of the frame with more metal than on the opposite side, whereby the frame is the better adapted to withstand the strain of compressing the gavel, substantially as specified.

3. In a grain-binder, a binder-frame cast integral, formed of two hollow cylindrical arms A and A² and a connecting part A' cast hollow and cylindrical, said arm A² formed with more metal on the needle side of the frame than on the opposite side, whereby the frame is the better adapted to withstand the strain of compressing the gavel, substantially as described.

4. The combination with the binder-frame, of the packers D' and D², operated by cranks on shaft D, the swinging links D³, clasp pipe C of the binder-frame and depending therefrom, pivoted to the rear end of the packers and supporting the same, operating substantially as and for the purpose set forth.

5. In a grain-binder, the combination of the discharge-arm L² hub M fastened to shaft H opposite to the knotter-operating gear, latch M' pivoted to said hub, flange M³ formed upon said hub, stop O fastened to the breastplate, and trip N pivoted to the breastplate, operating substantially as and for the purpose set forth.

6. The combination of a knotting-hook having a rigid and a hinged jaw, given a rotary movement, and a cord-holding mechanism having a portion of its periphery beveled to lift the hinged jaw of the knotter by contact with said beveled part, said cord-holder given a rotary movement in the direction to meet the knotter and to draw the cord within the knotter-jaws, substantially as specified.

7. The combination of the cord-holder disk R, formed with the gathering-points *h'*, the openings *h*, the groove *g* on the under side of said disk, the stationary grip-piece *g'* coacting with said disk-groove to hold the twine, and a knotting-hook adapted to grasp the end of the twine from said cord-holder, and to tie the knot, substantially as set forth.

8. The combination of the cord-holder disk R given a rotary motion, formed with the gathering-points *h'*, the openings *h*, and the groove *g*, the stationary grip-piece *g'* coacting with the disk-groove to hold the twine, the secondary twine-holding piece *g*² operating on the disk-surface opposite groove *g* to hold the twine, and a knotting-hook adapted to grasp the ends of the twine from the holder and to tie the knot, substantially as set forth.

9. The combination of a cord-holder, given a rotary motion, having a groove in which a stationary knife is held, the walls of said groove being cut to form a notch in which the twine is caught and passed against the knife, and a knife having a guard extending in advance of the cutting-edge, adapted to hold the twine in the aforementioned notch to insure its being cut, substantially as set forth.

10. The combination of a cord-holder disk R, given a rotary motion, formed with the flanges *f* and *f'* and grooves *g* and *i*, said flanges having the twine-engaging notches *j*, the grip-piece *g'* coacting with groove *g* to hold the twine, and the knife *k* provided with the guard *k'* held in the groove *i*, operating substantially as and for the purpose set forth.

WILLIAM WORTH BURSON.

Witnesses:

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RALPH EMERSON, Jr.