No. 813,698.

PATENTED FEB. 27, 1906.

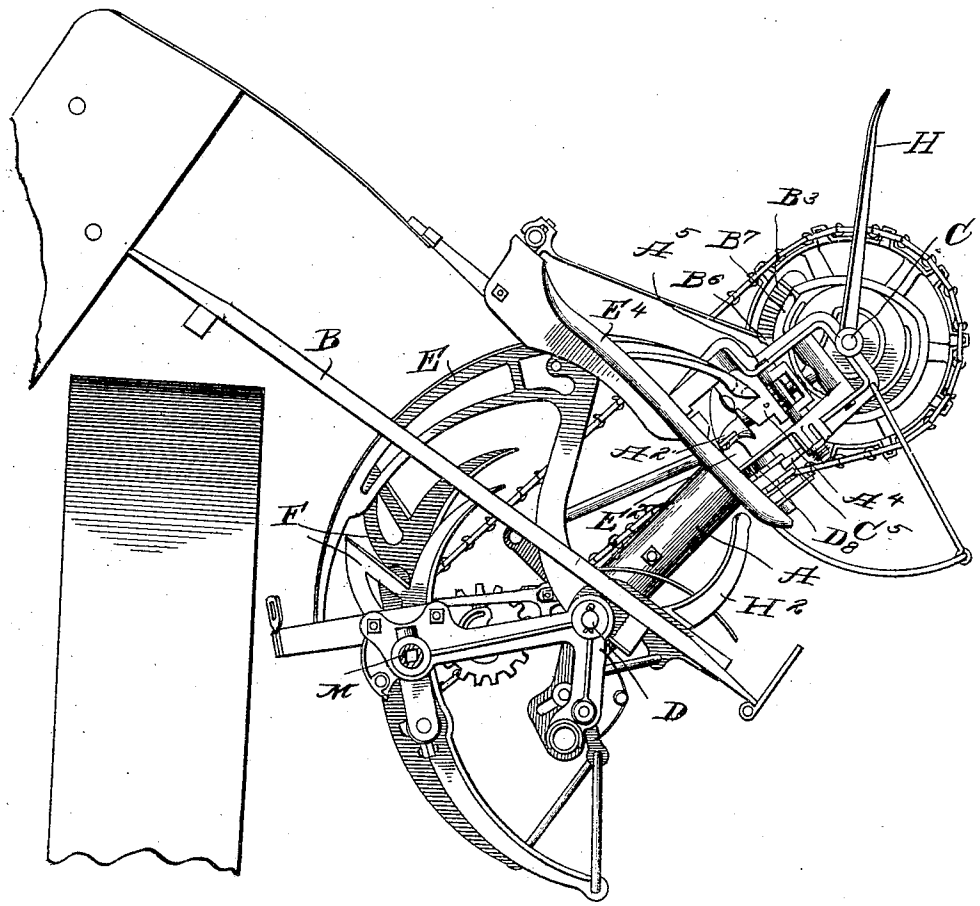
P. HANSON.

KNOTTER MECHANISM FOR GRAIN BINDERS.

APPLICATION FILED SEPT. 22, 1902.

5 SHEETS—SHEET 1.

Fig. 1.



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5 SHEETS—SHEET 2.

Fig. 2.

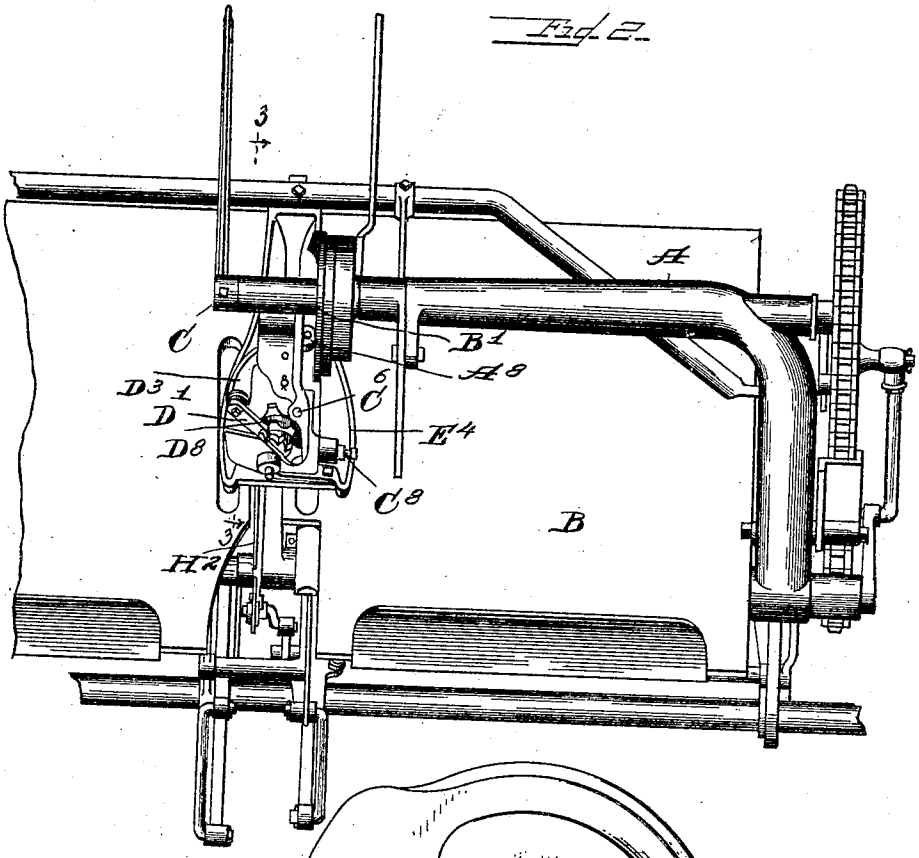
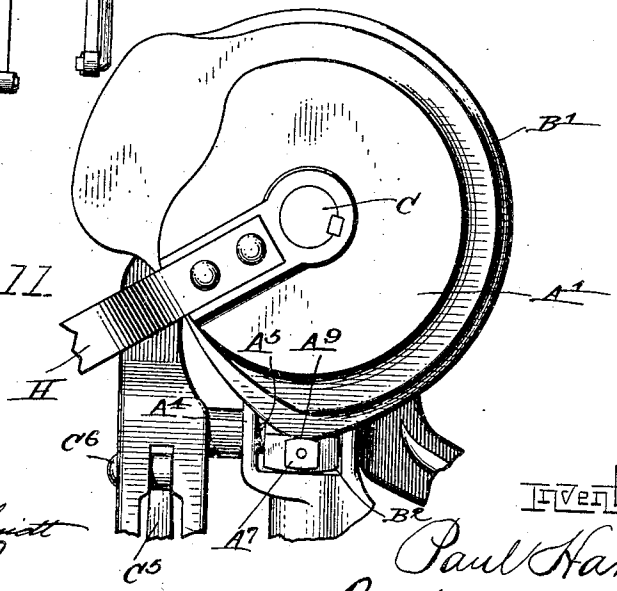


Fig. 11.



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5 SHEETS—SHEET 3.

Fig. 3.

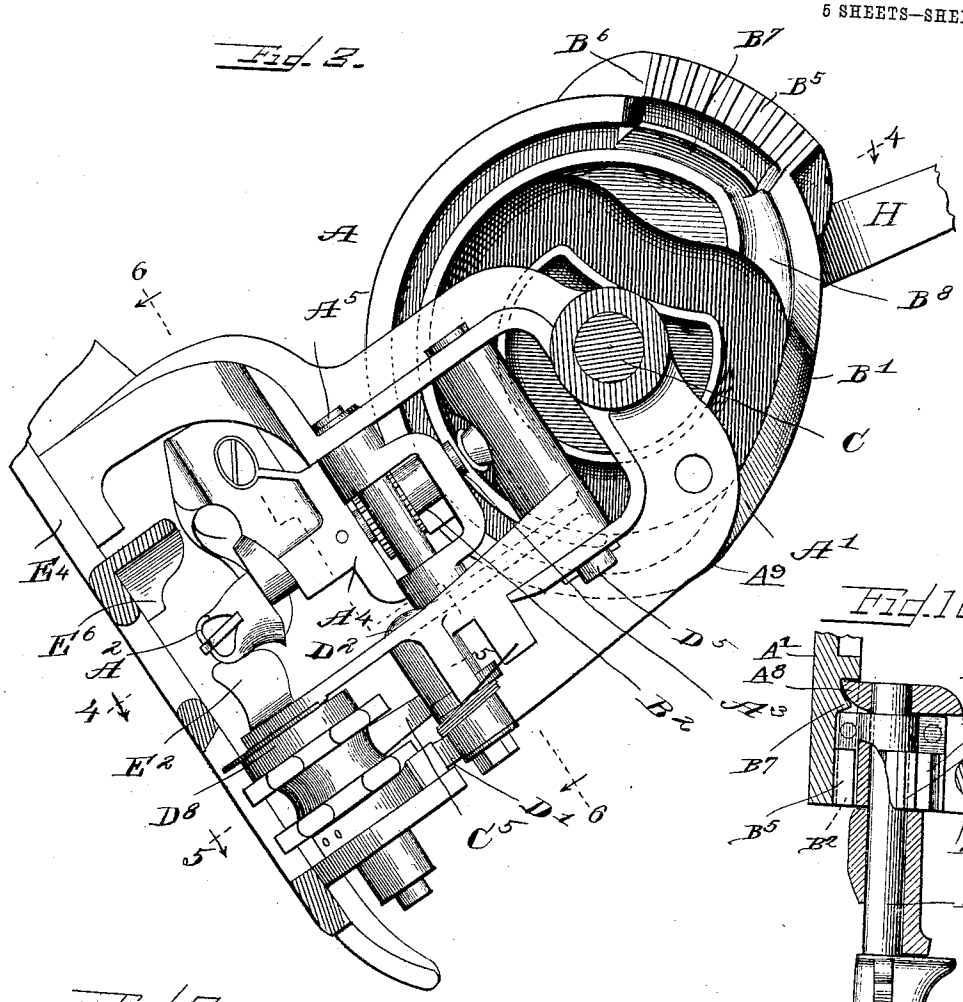


Fig. 10.

Fig. 8.

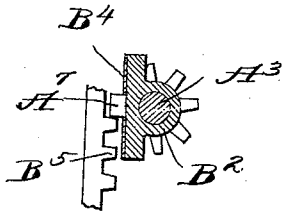
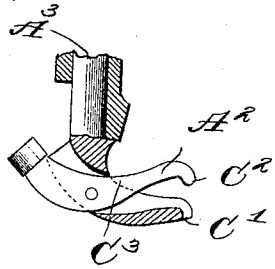


Fig. 9.



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5 SHEETS—SHEET 4.

Fig. 4.

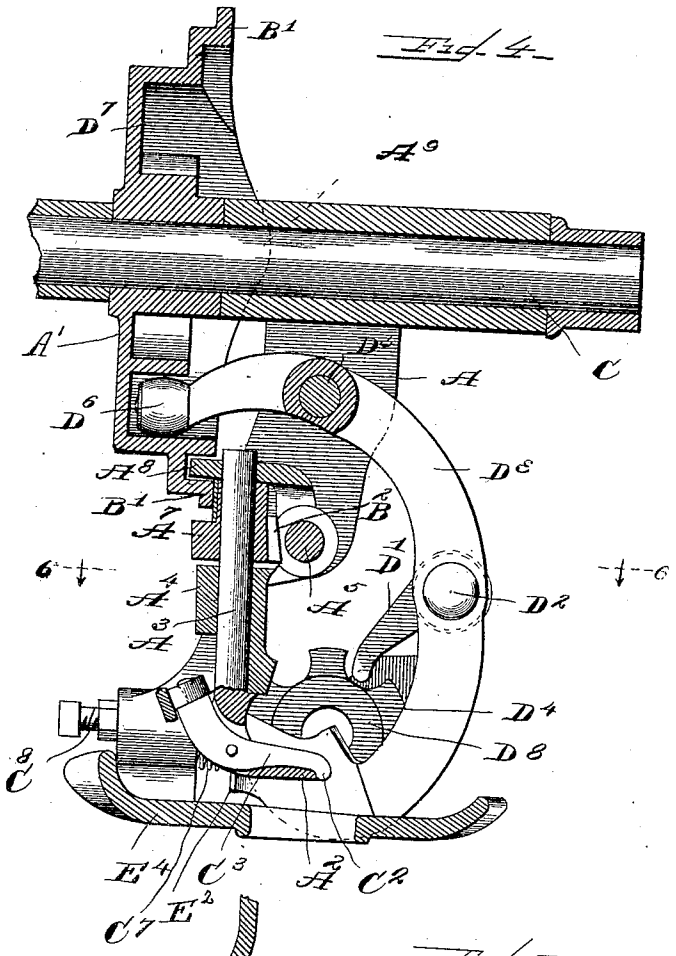
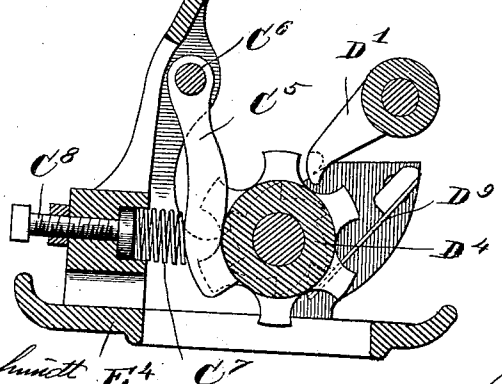


Fig. 5.



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APPLICATION FILED SEPT. 22, 1902.

5 SHEETS—SHEET 5.

Fig. 6.

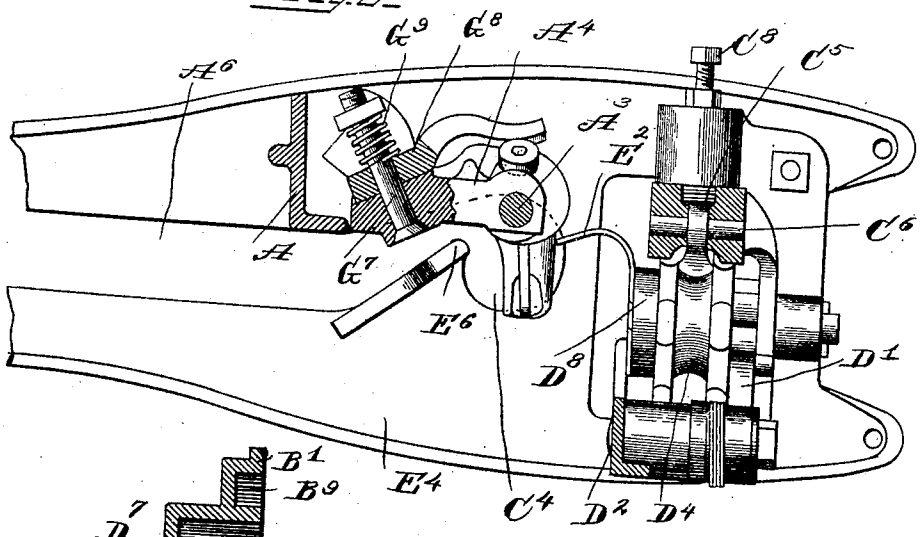
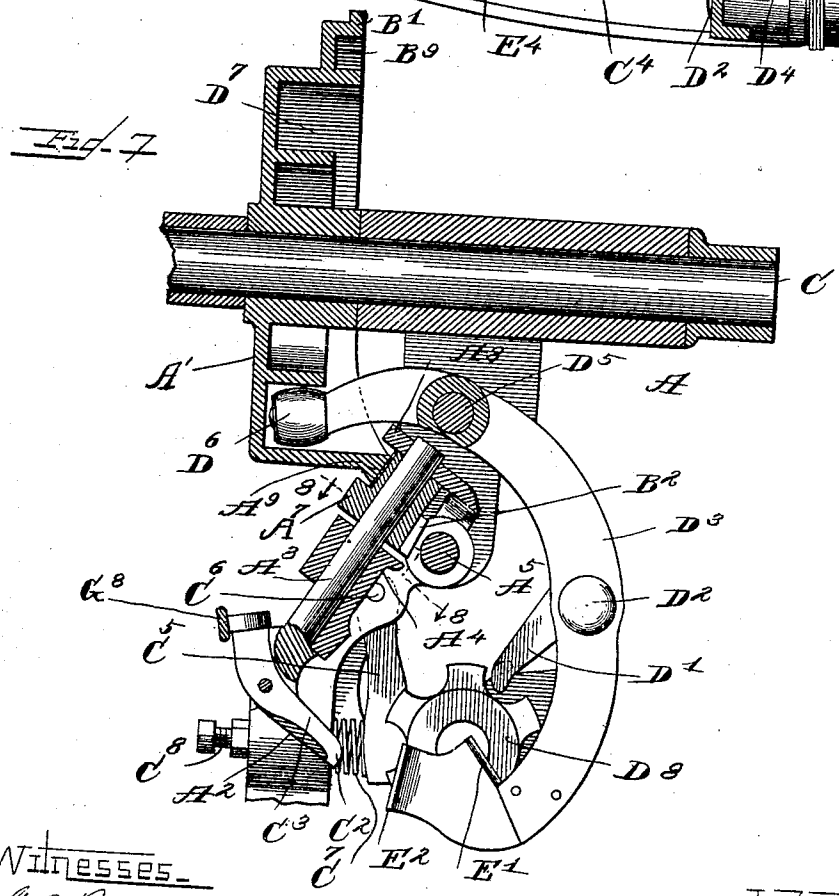


Fig. 7.



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UNITED STATES PATENT OFFICE.

PAUL HANSON, OF ST. PAUL, MINNESOTA.

KNOTTER MECHANISM FOR GRAIN-BINDERS.

No. 813,698. Specification of Letters Patent. Patented Feb. 27, 1906.

Application filed September 22, 1902. Serial No. 124,486.

To all whom it may concern:

Be it known that I, PAUL HANSON, a citizen of the United States, residing at St. Paul, in the county of Ramsey and State of Minnesota, have invented a new and useful Knotter Mechanism for Grain-Binders, of which the following is a specification.

This invention relates to knotter mechanism for grain-binders.

The object of the invention is to simplify and improve the construction of knotter mechanisms for grain-binders and to render the same more efficient in operation.

A further object of the invention is to provide a construction of knotter mechanism for grain-binders which is equally well adapted for use with binder-twine of different sizes or diameters.

Other objects of the invention will appear more fully hereinafter.

The invention consists, substantially, in the construction, combination, location, and arrangement of parts, all as will be more fully hereinafter set forth, as shown in the accompanying drawings, and finally pointed out in the appended claims.

Referring to the accompanying drawings, and to the various views and reference-signs appearing thereon, Figure 1 is a view in side elevation of a grain-binder, showing the application thereto of a knotter mechanism embodying the principles of my invention. Fig. 2 is a view in elevation, taken from the discharge side of the machine. Fig. 3 is an enlarged detail view in section on the line 3 3, Fig. 2, looking in the direction of the arrows. Fig. 4 is a detail view in section on the line 4 4, Fig. 3, looking in the direction of the arrows. Fig. 5 is a broken detail view on the line 5 5, Fig. 3, looking in the direction of the arrows. Fig. 6 is a broken detail view on the line 6 6, Figs. 3 and 4, looking in the direction of the arrows. Fig. 7 is a view similar to Fig. 4, showing a displaced position of the parts. Fig. 8 is a detail view in section on the line 8 8, Fig. 7, looking in the direction of the arrows. Fig. 9 is a broken detail view in section through the knotter-bill. Fig. 10 is a detail view in section, showing the rack-teeth of the knotter-operating wheel in engaging relation with respect to the pinion of the knotter-bill shaft. Fig. 11 is a detail sectional view showing the engagement of the enlargement or projection of the cam-wheel with the projection A^7.

The same part is designated by the same reference-sign wherever it occurs throughout the several views.

In the drawings, reference-sign A designates the binder-frame of a grain-binder; B, the binder-deck; C, the knotter-operating shaft; D, the needle-shaft; E, the needle; F, the packers, and H the bundle-discharge arm, which is mounted upon to revolve with the knotter-operating shaft. These parts may be of the usual or any well-known construction and arrangement and in the specific details of construction and arrangement thereof form no part of the present invention.

In the practical operation of a grain-binder rotation is imparted to the packer-shaft M and thence to the packer-cranks by which the packers are operated. Through suitable clutch mechanism automatically actuated or disengaged a gearing is operated to impart to the needle and knotter mechanisms a cycle of operation to advance the needle to its work of compressing the gavel and leading the binder-twine into proper relation with respect to the knotter mechanism. During the cycle of operation of the knotter mechanism the binder-twine, which is applied around the gavel or bundle formed by the packers in connection with the compressor-hook H^2 by the advancement of the needle, is knotted and severed and the bound bundle is discharged from the machine. My present invention concerns itself with the construction of the knotter mechanism, and, except in the way of a general coöperation of parts, the particular construction or type of the packing, compressing, and needle mechanisms is unimportant so far as my present invention is concerned, and as the operation of such mechanisms is familiar to persons skilled in the art it is unnecessary herein to specifically set forth the same further than to say that when the clutch mechanism, which throws the needle and knotter mechanisms into operation, is actuated one complete rotation is imparted to the knotter-operating shaft C and a partial rotation is imparted to the needle-operating shaft D to advance the needle and then a reverse rotation is imparted to the needle-shaft to retract the needle to a position beneath or below the binder-deck, and when these cycles of operation are completed the clutch mechanism operates automatically to disconnect the operating-gearing of these parts until the next bundle is formed and is ready to be tied and discharged. Mounted upon the knotter-op-

erating shaft to rotate therewith is the knotter-operating cam-wheel A′, by which the various operating parts of the knotter mechanism are actuated.

A² designates the knotter-hook, which is carried on a short shaft A³, suitably journaled in bearings formed in a swinging frame A⁴. This swinging frame is hinged or pivoted upon a stud A⁵, suitably mounted in a fixed part of the binder-frame A, and preferably directly above the point at which the knot is formed in the binder-twine by the knotter mechanism, and also preferably directly above and parallel with the slot or opening A⁶ in the breastplate E⁴, through which the needle operates. This pivot pin or stud permits the swinging frame A⁴ to rock or swing laterally with respect to the plane of operation of the needle. In Fig. 4 I have shown this swinging frame in the position occupied thereby during the knot-forming operation, and in Fig. 7 I have shown said frame rocked or swung back to effect a stripping of the knot from the knotter-bill preparatory to a discharge of the bundle from the machine. The frame A⁴ is provided with a lug or flange A⁸, (see Figs. 4 and 7,) and pinion B² is provided with a lug A⁷ and with a flattened or planed portion or surface B⁴ on the hub thereof. Said lugs A⁷ A⁸ are arranged to receive a rim or flange of knotter-operating wheel A′, and said rim or flange is provided with an enlarged portion A⁹, which effects the swinging movement of frame A⁴. The delay-surfaces on the face of the cam-wheel A′ and indicated at B′ engaging the flattened or planed side or surface B⁴ of pinion B² serve to lock said swinging frame against swinging movement except under the influence of the enlargement A⁹ of the cam-wheel. B² designates a pinion mounted upon said shaft A³ and through which rotation is imparted to the knotter-bill. This pinion is provided with gear-teeth for a portion only of the peripheral surface thereof and which are engaged or intermeshed with gear-teeth B⁵, formed on the knotter-operating cam-wheel. The delay-surfaces B′ on the face of cam-wheel A′, and which engage or bear against the flattened or planed side portion or surface B⁴ on the hub of pinion B², not only serve to prevent swinging movement of frame A⁴, but also rotating movement of shaft A³, except when the teeth of pinion B² are engaged or intermeshed with the gear-teeth B⁵ on the cam-wheel, and at this point in the operation of the apparatus the delay-surfaces B′ are interrupted, as clearly shown in Fig. 3.

The stud or projection A⁷, which is above referred to as forming an engaging flange or lug for the rim of cam-wheel A′, is formed on pinion B² and also serves the purpose of insuring efficient intermeshing of the gear-teeth of pinion B² and the operating rack-teeth B⁵ of the operating-wheel, said stud being arranged to be engaged by the shoulder or surface indicated at B⁶ in Fig. 3, thereby imparting a slight initial rotation to the pinion B², which initial rotation is sufficient to effect an intermeshing of the teeth of said pinion with the rack-teeth B⁵ in a well-understood manner. The face of the cam-wheel is provided with a ridge B⁷ at a point adjacent or opposite the gear-teeth B⁵, and the flange A⁸ on frame A⁴ is provided with an inclined face which engages said ridge and operates to hold the pinion firmly in mesh with the teeth on the cam-wheel. The cam-surface of the cam-wheel immediately following in form of travel the gear-teeth B⁵ and as indicated at B⁸, Fig. 3, engages the flange A⁸ to impart the initial rocking movement to swinging frame A⁴, and by forming the enlargement A⁹, upon which enlargement inclined portion B⁸ of the cam-surface delivers, so as to form a continuation thereof, I am enabled to secure an increased leverage for rocking frame A⁴ to swing the knotter-bill into a downwardly-pointed position, as indicated in Fig. 7, which is the most favorable position for stripping off the knot. It will be observed that the hinge or pivot stud A⁵ of rocking frame A⁴ is placed directly in front of the pinion, and this arrangement, together with the placing of said hinge or pivot stud directly over the portion of the knotter-bill around which the twine is wrapped during the formation of the knot and substantially in the plane of action of the needle, enables me to secure a long bearing for the pivot-pin and brings the pivot-pin opposite the bearing of the delay-surfaces on the cam-shaft, thereby enabling it to serve as a brace to firmly hold the pinion in engagement with the rack-teeth on the cam-wheel and also enables the frame A⁴ to be swung without throwing the delay-surfaces and pinion too far away from each other—that is, without carrying the pinion too far away from the cam-wheel. Moreover, this arrangement requires less locking mechanism or cam or delay surfaces to hold the parts together. As above indicated, the lug or projection A⁷ coöperates with the flange A⁸ and, operating against the outer surface of the rim of the cam-wheel when the frame A⁴ is rocked into the position shown in Fig. 7 while the flange A⁸ engages in the track B⁹ in the face of the cam-wheel when the parts are in the position shown in Fig. 4, serves to hold the swinging frame in proper relation.

In order to adapt the knotter mechanism to different sizes of binder-twine, the knotter-hook A² of the bill is made wider and deeper than the ordinary knotter hook as heretofore employed and which knotter hook or bill is provided with a notch or opening C′ (see Fig. 9) through the bottom thereof at its extreme end to receive the hooked end C² of the knotter-jaw C³. This enables the machine to operate satisfactorily on different sizes of twine

without unduly increasing or varying the size of the knotter-bill. This is particularly important in that it enables me to use a knotter mechanism in which grass twine is employed as the binder-twine.

The location of the pivot pin or stud upon which frame A^4 is pivoted, as above explained, enables me to employ a comparatively large area of opening through the breastplate at the point indicated at C^4 in Fig. 6, thereby enabling the rotations of the knotter-bill to be effected during the formation of the knot without danger of injuring or bruising the twine during such operation by being brought into contact with the edges of the opening through the breastplate during the rotation of the knotter-bill to form and tie the knot. This I regard as a valuable point, especially when the apparatus is employed with grass twine, as it avoids danger of breaking or injuring the twine during the formation of the knot.

I will now describe the cord clamping and severing mechanism and the stripper which coöperates with the knotter-bill to strip the knot from the knotter-bill.

D^4 designates the cord-disk. This is made in the ordinary manner, except as hereinafter specified, with seats or teeth, in or between which the cord is placed by the needle when the latter is advanced to its work. As clearly indicated in Fig. 6, the seats or teeth which receive the twine are in the form of disks, suitably spaced apart, and between which operates the cord-clamp C^5. This cord-clamp is in the form of an arm or lever, pivotally mounted, as at C^6, and arranged with its free end to bear against the surface of the cord clamp or block between the disks or flanges in which the twine is laid by the needle, and said clamp arm or lever is yieldingly pressed into bearing contact with the peripheral surface of said block in any suitable manner—as, for instance, by means of a spring C^7, the tension of which may be readily adjusted—as, for instance, by means of a set-screw C^8. After the binder-twine is placed in a seat in the clamp disk or block rotation is imparted to said block, so as to carry the ends of the cord between the clamping-lever C^5 and the block D^4, thereby firmly and securely holding the ends of the twine during the formation of the next bundle. The rotations may be imparted to the cord clamp, disk, or block D^4 in any suitable or convenient manner. I have shown an ordinary way for accomplishing this result, wherein a pawl D' is pivotally mounted, as at D^2, upon a lever D^3, which in turn is pivoted, as at D^5, upon a fixed part of the framework. This lever D^3 is provided with an end extension D^6 beyond its point of pivotal support D^5, which is arranged to operate in a cam-track D^7, formed in the cam-wheel A', and by means of which rocking movement is imparted to said lever, thereby causing the pawl D' to be periodically advanced and retracted. This pawl engages ratchet-teeth formed on the cord-clamp block in the ordinary manner to rotatively actuate the same step by step. The backward rotation of the cord-clamp block may be opposed in any manner—as, for instance, by means of a spring D^9. (See Fig. 5.)

The cord-clamp block D^4 is provided with an extended hub portion, (indicated at D^8,) across the face of which the severing-blade E' operates. This severing blade or edge is carried by the lever D^3 and operates against the edge of the extended hub D^8 as a ledger-blade. This very materially simplifies the construction of severing mechanism and also enables me to employ an inclined knife-edge, as clearly indicated in Figs. 4 and 7, thereby enabling me to secure a shear cut, and the arrangement of the knife-carrying arm or lever D^3 is such that the severing occurs during the outward swing of that portion of said arm which carries the cutter. A stripper E^2 is also carried by the knife-arm D^3 and operates to strip the formed knot from the knotter-bill. The swinging movements of frame A^4, which carries the knotter-bill, and of knife-arm D^3 are so proportioned and timed that the outward swinging movement of the knife-arm to sever the cord and to strip the knot from the knotter-bill coöperates with the inwardly-swinging movement of the frame which carries the knotter-bill and which also carries the knotter-bill into a downwardly and outwardly inclined position, as indicated in Fig. 7. This I regard as a valuable feature of my invention, as thereby the knot is most efficiently stripped from the knotter-bill.

I prefer to provide the bearing-surface of the clamp-block D^4, against which the clamp arm or lever D^3 bears, with a groove, as shown most clearly in Fig. 3, and to correspondingly shape the engaging surface of the clamp-lever. By this construction I secure an efficient clamping effect upon the twine by causing the same to be bent into the contour of the clamping-groove in the block and without imposing too great a tension upon the clamp-lever.

In case a knot should be missed and the twine become tangled or caught in the opening of the breastplate it is desirable to provide means for clearing the entangled twine from the bill. To insure this result, I provide the breastplate with a lug or extension E^6, (see Figs. 3 and 6,) arranged to project out toward the path of the knotter-bill at each operation to cut the twine or clear the bill in case of any undue obstruction thereof.

The operation of forming a knot by a knotter mechanism is familiar to persons skilled in the art, and therefore need not be set forth herein in detail. In general, however, I will

say that in the operation of a machine embodying my invention the packers operate to form the gavel, and when a sufficient quantity of grain has been formed into a gavel to produce a bundle the trip mechanism is actuated, which throws into operation the needle and knotter operating mechanisms. Thereupon the needle is advanced toward the compressor-hook to compress the gavel, to apply the binder-twine around the formed gavel, and to place the twine in the cord-clamp. During this movement of the needle the knotter-operating cam-wheel is being revolved, but is performing no other work with reference to the knot-forming mechanism except to lock the knotter-operating shaft and the cord-severing arm against movement. As the needle approaches its fully-advanced position the knife-arm begins to swing or rock, thereby carrying the knife-edge into a position for the cord to be received between the same and the peripheral edge of the hub or extension of the cord-clamping holder or block. At the same time the cord-clamping block is rotated to effect a clamping of the cord or twine which is placed in position in the cord-clamping block by the needle. When this clamping operation is effected, the operating cam-wheel is brought into such position as to effect an engagement of the gear-teeth thereon with the knotter-operating pinion, thereby causing the knotter-bill shaft to rotate and the knotter-jaw to open in the ordinary manner and to close upon the twine to grasp the same and to form the knot therein, as is well understood. The needle now begins its return movement, and by reason of the enlargement of the rim of the cam-wheel the inwardly-swinging movement of the knotter-bill frame begins, while the cutter-carrying arm begins its outward swing, thereby severing the cord with a clean shear cut against the edge or face of the hub of the cord-clamping block and causing the stripper to strip the knot from the knotter-bill.

It will be observed that a bolt G^7 is mounted in the knotter-frame and a curved cam-arm G^8 is mounted thereon. A spring G^9 adjustably mounted on said bolt serves to yieldingly press said arm against the knotter-frame. This cam-arm coöperates with the knotter-jaw C^3 to operate the latter.

Many variations and changes in the details of construction and arrangement would readily occur to persons skilled in the art and still fall within the spirit and scope of my invention. I do not desire, therefore, to be limited or restricted to the exact details shown and described; but,

Having now set forth the object and nature of my invention and a construction embodying the principles thereof, what I claim as new and useful and of my own invention, and desire to secure by Letters Patent, is—

1. In a knotter mechanism for grain-binders, a knotter-operating wheel, a knotter-bill, a frame in which said knotter-bill is mounted, a pinion for operating said knotter-bill, said frame being hinged or pivoted upon an axis, between which and said operating-wheel the pinion is located, and means for swinging said frame, as and for the purpose set forth.

2. In a knotter mechanism for grain-binders, a knotter-bill, a shaft carrying the same, a frame in which said shaft is journaled, said frame being hinged or pivoted, a pinion mounted upon said shaft, a knotter-operating wheel having gear-teeth with which said pinion coöperates to actuate said knotter-bill, said pinion being arranged between said cam-wheel and the pivotal axis of said frame; all combined and arranged as and for the purpose set forth.

3. In a knotter mechanism for grain-binders, a knotter-bill and its supporting-shaft, a frame in which said shaft is journaled, a pinion mounted upon said shaft, a cam-wheel having gear-teeth with which said pinion cooperates, said frame being hinged or pivoted upon an axis arranged over the point of operation of said knotter-bill, said pinion being arranged between the cam-wheel and the axis upon which said frame is hinged or pivoted, said cam-wheel provided with an enlargement arranged to engage said frame to rock the same, all combined and arranged as and for the purpose set forth.

4. In a knotter mechanism for grain-binders, a knotter-bill, a shaft carrying the same, a frame in which said shaft is journaled, a pinion mounted on said shaft, a cam-wheel, and a flange formed on said frame and arranged to engage said cam-wheel, said frame being pivotally mounted upon an axis arranged to one side of said pinion, said pinion being arranged between the cam-wheel and the axis upon which said frame is pivoted, said flange being arranged above said axis; all combined and arranged as and for the purpose set forth.

5. In a knotter mechanism for grain-binders, a knotter-bill, a pivotally-mounted frame in which said knotter-bill is mounted, a pinion for operating said knotter-bill, an operating cam-wheel having a track in the face thereof, a flange carried by said frame and arranged to operate in said track, and a guiding-lug carried by said pinion and engaging the outer rim of said wheel when said frame is rocked to one limit of its swinging movement; all combined and arranged as and for the purpose set forth.

6. In a knotter mechanism for grain-binders, a knotter-bill, a shaft therefor, a pinion mounted on said shaft, a frame in which said shaft is mounted, said frame being hinged or pivoted, a cam-wheel having gear-teeth, said pinion being located between said cam-wheel and the axis upon which said frame is pivoted, a lug formed on said pinion and arranged to

engage the rim of said wheel to form a guide for said pinion when said frame is rocked to one limit of its movement, a shoulder formed on said cam-wheel adjacent to the gear-teeth thereon and arranged to be engaged by the lug on said pinion to throw said pinion into mesh with the gear-teeth on said cam-wheel, said cam-wheel also operating to engage said frame to rock the same; as and for the purpose set forth.

7. In a knotter mechanism for grain-binders, a knotter-bill, a shaft, a frame in which said shaft is mounted, said frame being pivotally supported, a pinion mounted upon said shaft, an operating-wheel having gear-teeth, a flange formed on said frame, a ridge formed on said wheel adjacent to said gear-teeth, and with which said flange engages to lock said pinion and gear-teeth in mesh with each other during the rotation of said pinion, as and for the purpose set forth.

8. In a grain-binder, and in combination with a needle and packers and means for operating the same, of a knotter mechanism including a knotter-operating wheel, said wheel provided with gear-teeth for a portion of the face thereof and having a delay-surface and a trackway formed in the face thereof, said delay-surface being formed into an enlargement, a knotter-bill, a swinging frame in which said bill is mounted, a pinion for actuating said knotter-bill, and with which said rack-teeth coöperate, said pinion having a planed surface to coöperate with the delay-surface on said cam-wheel, said swinging frame having a flange arranged to operate in the trackway in the face of said cam-wheel and the planed surface on the pinion adapted to be engaged by the enlargement on the delay-surface in said cam-wheel to rock said frame, as and for the purpose set forth.

9. In a knotter mechanism for grain-binders, a knotter-bill, means for actuating the same, a swinging frame in which said knotter-bill is mounted, a cord-clamp, a swinging arm for actuating the same, a severing-cutter carried by said arm, and means for swinging said arm and frame in opposite directions, as and for the purpose set forth.

10. In a knotter mechanism for grain-binders, a knotter-bill, and means for operating the same, a swinging frame in which said bill is mounted, a cord-clamping block, a severing-cutter operating past the face of said block to sever the cord or twine, and means for moving said severing-cutter in a direction opposite to that in which said knotter-bill frame swings, as and for the purpose set forth.

11. In a knotter mechanism for grain-binders, a knotter-bill and means for actuating the same, a swinging frame in which said knotter-bill is mounted, a stripper operating to strip the knot from said knotter-bill, and means for moving said stripper and swinging said frame in opposite directions, as and for the purpose set forth.

12. In a knotter mechanism for grain-binders, a knotter-bill and means for operating the same, a swinging frame in which said knotter-bill is mounted, a stripper, a swinging arm carrying said stripper, and means for swinging or operating said arm and frame coincidently and in opposite directions, as and for the purpose set forth.

13. In a knotter mechanism for grain-binders, a knotter-bill and means for operating the same, a swinging frame in which said knotter-bill is mounted, a stripper, a swinging arm carrying said stripper, means for swinging said frame into position to point the knotter-bill downwardly, and means for coincidently swinging said stripper-arm in the opposite direction to strip the knot from the bill, as and for the purpose set forth.

14. In a knotter mechanism for grain-binders, a knotter-bill and means for actuating the same, a swinging frame in which said knotter-bill is mounted, a cord-clamp block, a pivotally-mounted knife-arm, a severing-blade carried thereby and coöperating with said clamp-block to sever the cord, a stripper also mounted upon said arm, and means for moving said stripper and knife-blade and said swinging frame in opposite directions, as and for the purpose set forth.

15. In a knotter mechanism for grain-binders, the combination with a needle and its operating mechanism, a breastplate having an opening through which said needle operates, a knot-forming mechanism including a knotter-bill, a supporting-frame therefor, means for rocking said frame transversely across the slot in said breastplate, and a shoulder or projection formed on said breastplate and arranged to project toward the path of movement of said knotter-bill when said supporting-frame is rocked, said shoulder or projection operating to clear the knotter-bill of entangled twine in case of failure of the knot-forming mechanism to tie a knot, as and for the purpose set forth.

In witness whereof I have hereunto set my hand, this 22d day of August, 1902, in the presence of the subscribing witnesses.

PAUL HANSON.

Witnesses:
CHAS. H. SEEM,
S. E. DARBY.