

(No Model.)

5 Sheets—Sheet 1.

A. STARK.
CORD KNOTTER FOR GRAIN BINDERS.

No. 465,436.

Patented Dec. 15, 1891.

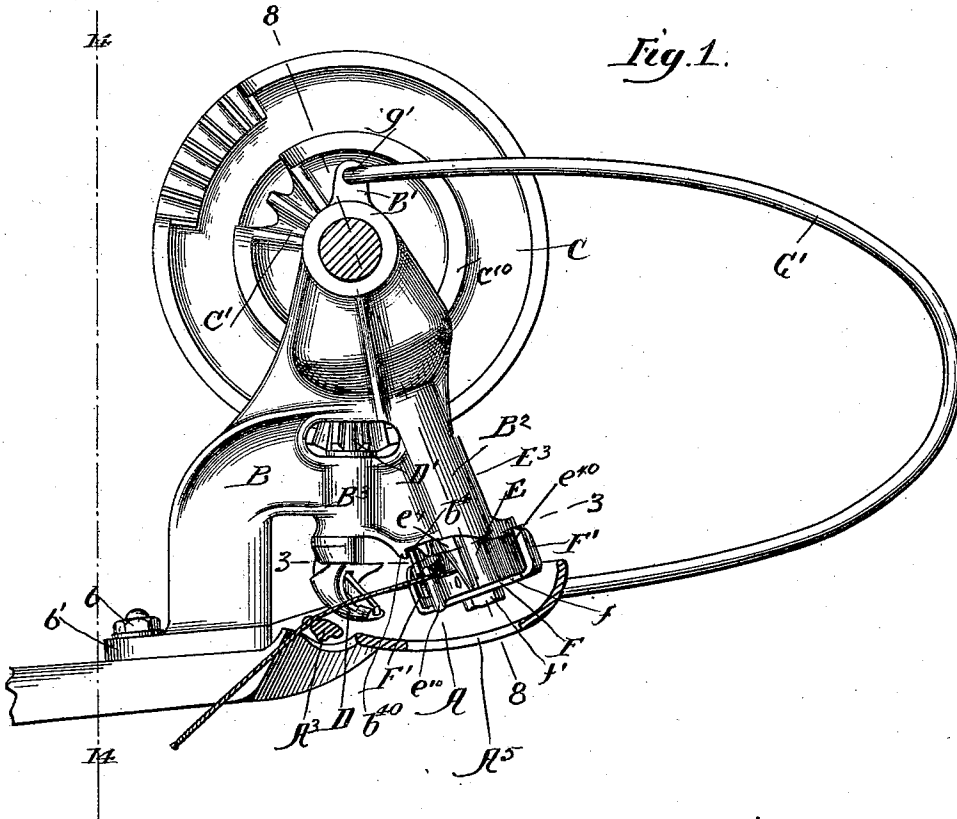


Fig. 1.

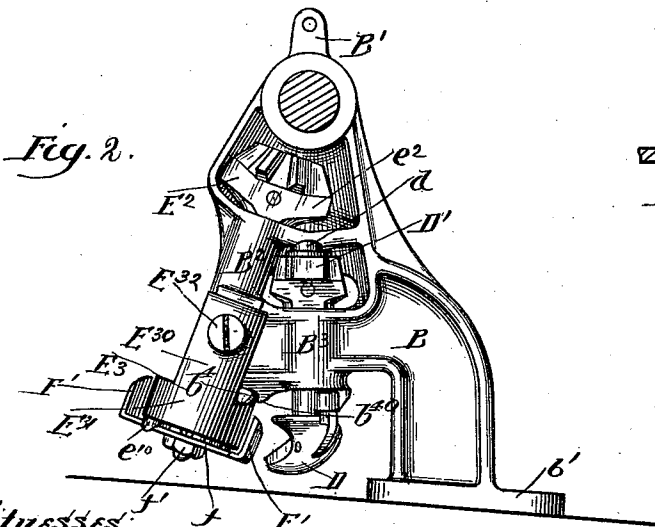
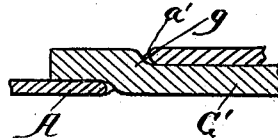


Fig. 2.

Fig. 15.



Witnesses:
Jean Elliott.
Celeste P. Chapman.

Inventor:
Andrew Stark
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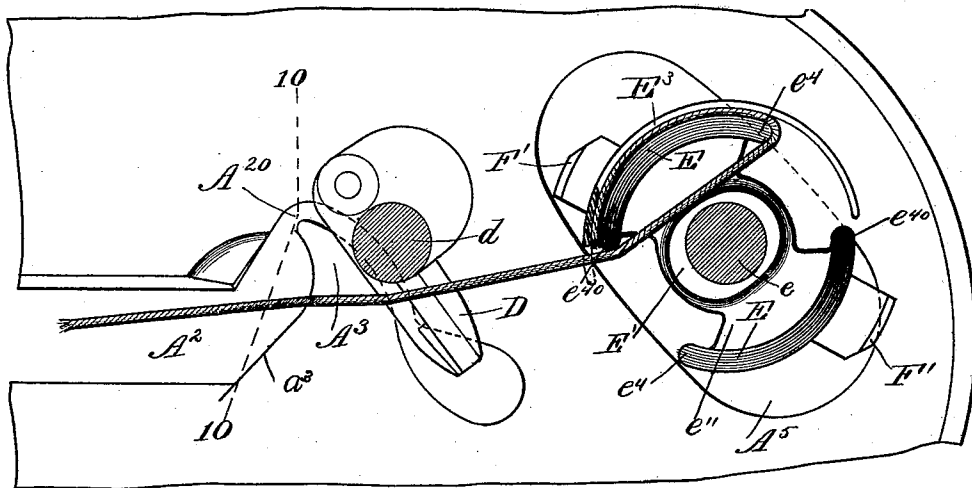


Fig 3

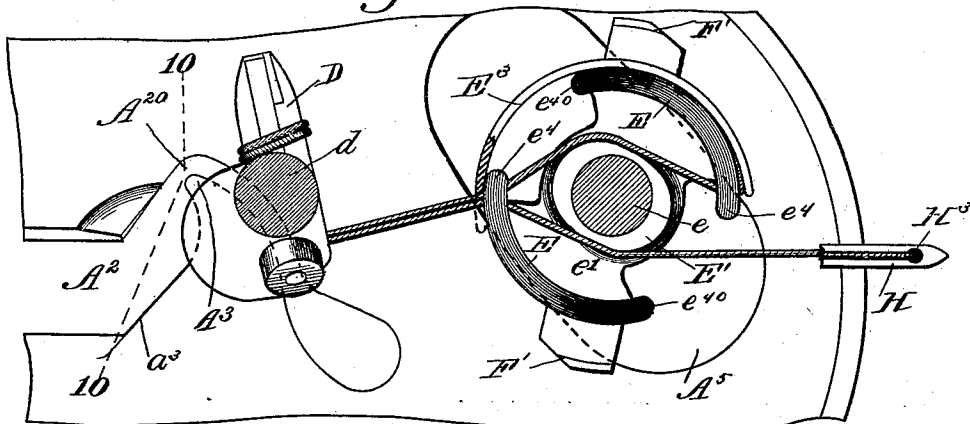


Fig 4

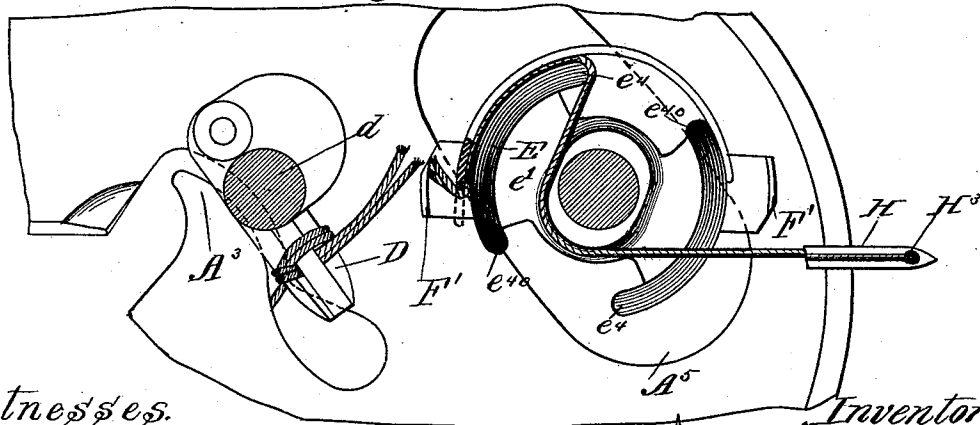


Fig. 5

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Fig. 6

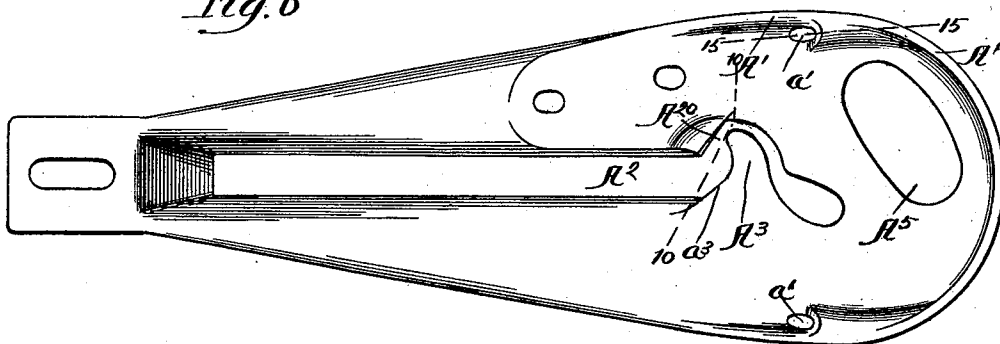


Fig. 7.

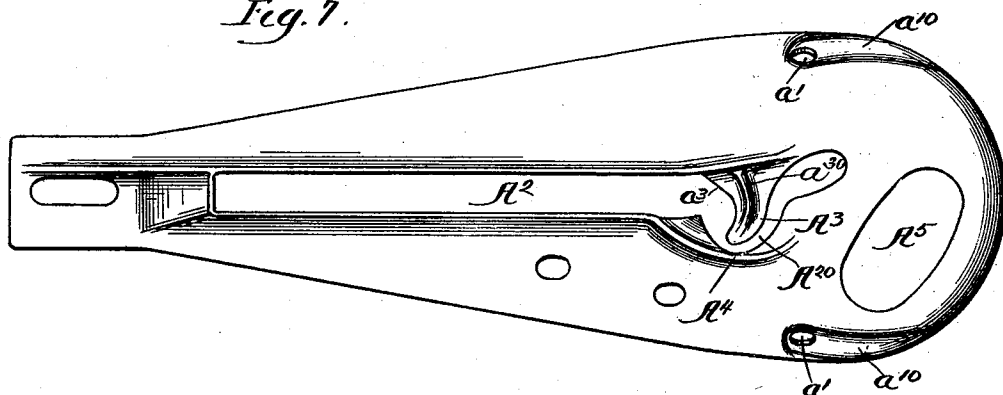
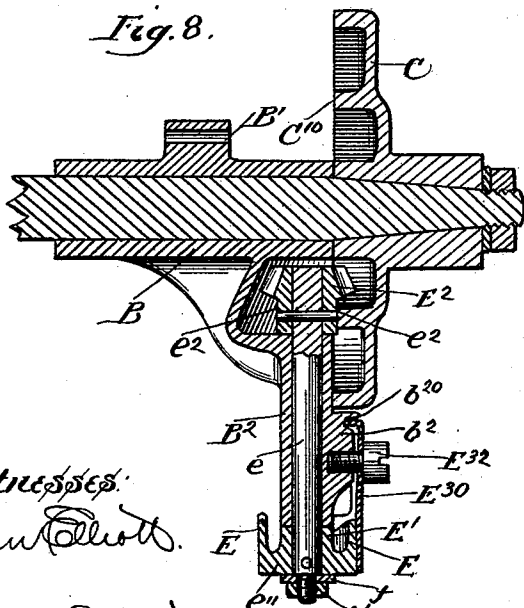


Fig. 8.

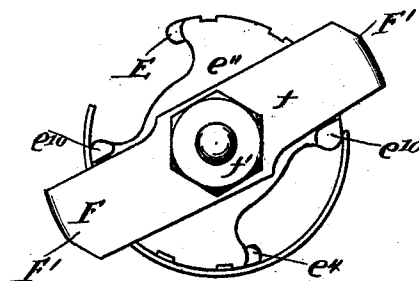


Witnesses:

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Fig. 9.



Inventor:

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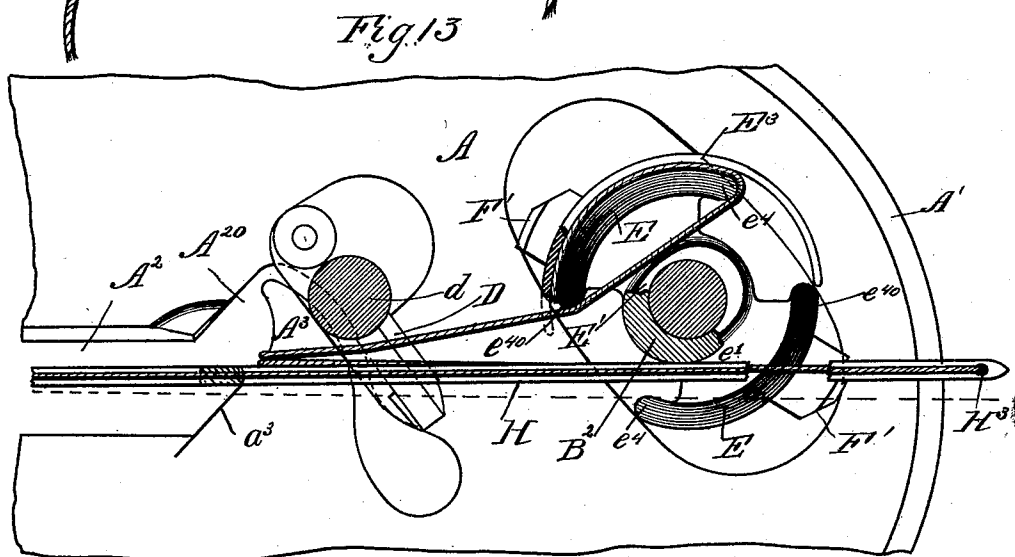
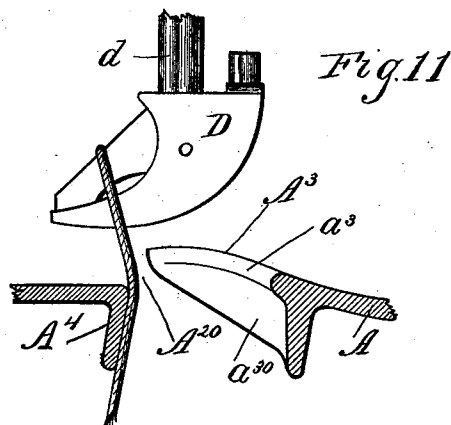
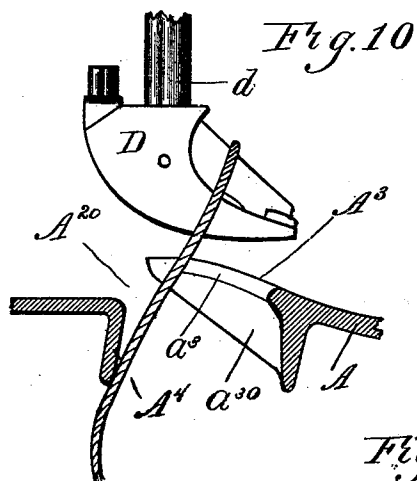
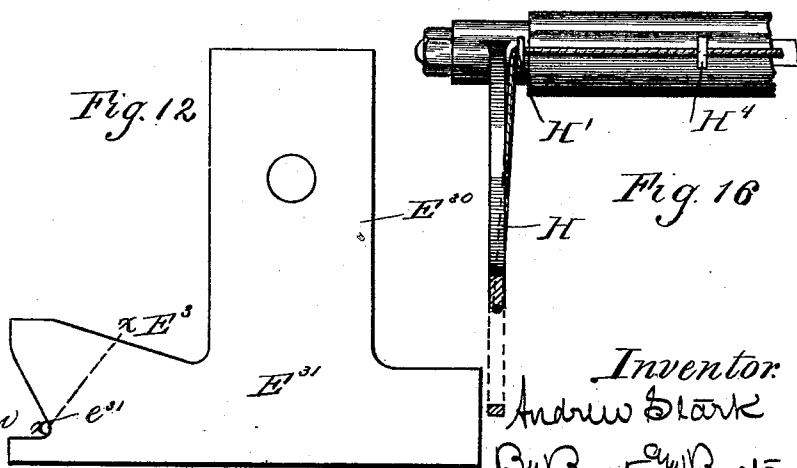


Fig. 12



Witnesses.
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Julia Haler.

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(No Model.)

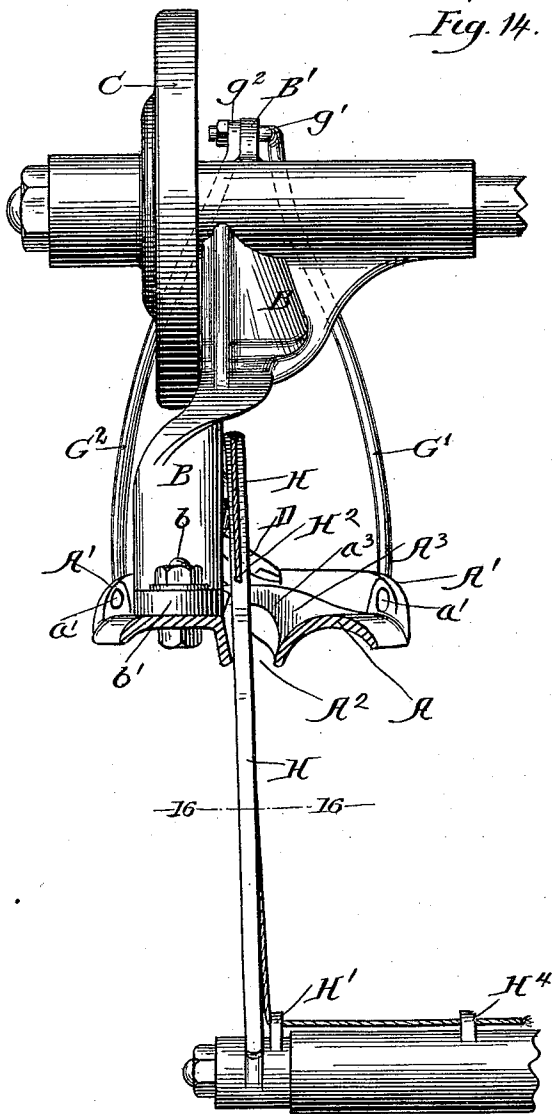
5 Sheets—Sheet 5.

A. STARK.

CORD KNOTTER FOR GRAIN BINDERS.

No. 465,436.

Patented Dec. 15, 1891.



Witnesses:
Jean Elliott.
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Inventor:
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UNITED STATES PATENT OFFICE.

ANDREW STARK, OF CHICAGO, ILLINOIS.

CORD-KNOTTER FOR GRAIN-BINDERS.

SPECIFICATION forming part of Letters Patent No. 465,436, dated December 15, 1891.

Application filed April 27, 1891. Serial No. 390,537. (No model.)

To all whom it may concern:

Be it known that I, ANDREW STARK, a citizen of the United States, residing at Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Cord-Knotters for Grain-Binders, which is fully set forth in the following specification, reference being had to the accompanying drawings, forming a part thereof.

10 In the drawings, Figure 1 is a front elevation of my improved knotter, showing the parts in the position of rest. Fig. 2 is a rear elevation with the driving-wheel removed. Fig. 3 is a horizontal section at the plane indicated by the line 3 3 on Fig. 1, showing the parts in the position occupied after the clamp being broken and shown in section, as at the broken line *xx* on Fig. 12. Fig. 4 is a sectional view at the same plane as Fig. 3, the clamp being similarly shown, showing the knotter has made about five-eighths of a revolution. Fig. 5 is a similar view showing the parts at the position occupied at the instant 25 the cord is severed, the knotter-bill having reached the position of rest. Fig. 6 is a top plan of the breast-plate. Fig. 7 is a bottom plan of the same. Fig. 8 is a section at the line 8 8 on Fig. 1. Fig. 9 is a bottom plan of the cord holder and cutter. Fig. 10 is a vertical sectional detail showing the contour of the marginal boundary of the cord-slot in its relation to the bill, section being made at the line 10 10 on Figs. 3 and 6, the knotter being 35 shown in the position of rest. Fig. 11 is a similar view, the knotter-bill being shown in the position in which it appears in Fig. 4. Fig. 12 is a plan of a blank from which the holder-clamp is formed. Fig. 13 is a view similar to Fig. 3, but showing the needle and the needle or spool cord, the position of parts being just as the needle comes home. Fig. 14 is a vertical sectional elevation looking outward, section being made at the plane of the line 14 14 on Fig. 1. Fig. 15 is a section at the line 15 15 on Fig. 6. Fig. 16 is a horizontal detail section at the line 16 16 on Fig. 14.

A is the breast-plate.

50 B is the knotter-frame secured to the breast-plate by the bolts *b*, through the foot-flange *b'* of said frame.

C is the knotter driving-wheel, commonly called the "cam-wheel."

D is the knotter-bill, and *d* its spindle.

D' is the knotter-bill pinion.

55 E E are the holder-segments formed in one piece upon opposite sides of the hub E', by which they are secured to the holder-spindle *e*.

E² is the holder driving-pinion at the upper end of the spindle *e*.

E³ is the holder clamp or shoe.

F is a double cord-cutter having a knife F' to co-operate with each of the holder-segments E, said knives being formed upon the upturned ends of a cross bar or plate *f*, which unites them, said plate extending under the holder and being retained on the spindle of the holder by the nut *f'* below the bar *f*. The cord-cutter is rotated by and with the holder-segments, said segments being provided each with the downwardly-projecting stud or stop *e*¹⁰, which engages the edges of the cutter and thereby drive it with the said segments.

75 G' G² are bundle-strippers—that is, arms which tend to strip the bundle off of the ejectors and prevent its being carried up around the shaft. They are formed of metal rods, each of which is bent near the end to form an offset or shoulder *g*, and are thereby adapted to be connected to the breast-plate by inserting said offset ends through the apertures *a' a'* in the breast-plate, said apertures being formed in the marginal upturned flange A' of the breast-plate, under which flange, outward from the apertures, there are formed seats *a*¹⁰, in which the rods are lodged after their offset ends *g* have been inserted through their apertures from the under outer side, so that the shoulders *g* are engaged by the edges of the apertures. These arms are then brought around in proper shape to act as strippers, and the end *g'* of the rod G', which is bent at right angles, is inserted through the lug B' on the top of the frame B, and the corresponding end of the other rod G² is formed with an eye *g*², which receives the laterally-bent end *g'* of the first rod G', and a nut applied on said end outside the eye fastens them together and to the lug B'. The upstanding flange A' of the breast-plate tends to prevent the said arms from being crowded 100

together by the action of the grain, while the overhanging portion of said flange, forming the seat proper, holds the arms down in proper position.

5 H is the needle or binder arm. It has the guide-eyes H^1 , H^2 , and H^3 for the binding-cord. The first of said guide-eyes is located as near as possible to the hub or axis of the needle, and the last is the final eye, and the one commonly referred to as simply the "eye" of the needle.

H^4 is a guide-eye for the cord on a fixed part of the frame, being the last guide before the cord enters the needle.

15 The breast-plate A has the cord-slot A^2 , which, at a little distance from the axis of the bill, is deflected toward the vertical plane of that axis and extends to the opposite side of said plane and is again deflected back to substantially its original plane, the double-deflected portion A^{20} bounding thus a finger A^3 , which is hereinafter named the "cord-arresting" finger. The upper surface of that portion of the breast-plate which would be cut off by a line commencing where the deflection of the slot commences and extending in the original direction of the forward edge of the slot and including, therefore, the cord-arresting finger A^3 , is preferably elevated above the general plane of the upper surface of the breast-plate, as illustrated, so that the point of said finger stands above the plane of the upper surface of the breast-plate at the rear of the slot opposite the end of the finger.

35 The forward edge of the slot at the commencement of the deflection described is deflected at an angle of about forty-five degrees from the previous trend of the slot, and the stroke of the needle is such that the needle encounters by its inner edge this deflected edge a^3 just before it comes "home," and is by said edge forced slightly aside from its normal path and thereby carried over toward the axis of the knoter-bill, so that it lies over against the bearings of the knoter-bill spindle and the holder-spindle, and being thus laterally restrained between the deflective edge of the cord-slot on one side and the knoter-frame on the other side is held rigidly to a definite and unvarying path and prevented from springing or yielding laterally under the strain of the cord or from any other cause, thus making it possible to bring the binder-arm home with sufficient force to compensate for the springing of the parts of the binder-frame, which may result from the compression of a large bulk of grain and to insure the placing of the needle-cord where it will be engaged by the knoter-bill as the latter revolves under any and all circumstances. The deflected edge of the breast-plate slot also acts as a check to limit the stroke of the needle, preventing it from going so far forward as to interfere with the action of the knoter-bill. It will be observed that the cord running from the needle-eye will have encountered the same deflecting edge a^3 before

the needle encounters it, and will have been guided in the same direction, so that the needle afterward encountering the edge will merely follow in alongside the cord and will not pinch it nor engage it in any way between itself and the said deflecting edge. The deflection of the cord by this edge has the familiar purpose of guiding it more certainly onto the bill. The deflection of the needle has a purpose which relates to the cord-holder and which will hereinafter appear. The retiring needle of course lays the cord whose end is held in the holder over the same deflecting edge a^3 ; but this is of slight consequence, because the cord being taut, as hereinafter explained, and running from the holder at a point which is even farther rearward than the point at which it needs to cross the bill in order to close the jaw, there is no opportunity for the said deflecting edge to influence the deflection of the cord to said position.

While the bundle is being packed against the cord, which, running from the holder and thence over the bill, hangs over the cord-arresting finger A^3 , the grain frequently by reason of being thrown into the binder in bad shape and with oblique pressure against the cord, or more frequently by reason of the butting devices pushing it endwise after it has rested against the cord, has a tendency to push the cord rearward—that is, toward the point of the finger. In order that this tendency may not result in dislodging the cord from the finger, I expand vertically the rear edge of the needle-slot at the deflected portion A^{20} , as by providing said edge with the rib or flange A^4 , the lower edge of said flange forming the limit for the rearward deflection of the cord under the breast-plate. Since all the pressure arising from the cause stated tending to dislodge the cord from the finger will be experienced below the breast-plate and no tendency of the sort will be experienced above the lowest point of the breast-plate, that being the highest point to which the grain can rise to affect the cord, and since the cord will be taut wherever it is experiencing the pressure of the grain, and since at the commencement of the deflecting tendency, if such tendency arises, the cord extends stretched from the holder over the bill and over the finger, and when moved by pressure tending to dislodge it will rest against the said flange which bounds the slot at said deflected portion, it is only necessary, in order that such rear pressure may be prevented from dislodging the cord from the finger, that from any point of the edge of the flange, thence over the finger, and thence to the point where the cord rests on the bill, the shortest course leads by way of a point on the edge of the finger between the end and the point where the cord will normally rest before such disturbing rearward pressure has been experienced. A vertical expansion of said rear side of the slot which shall bring the lower

edge at a point opposite the finger from three-fourths of an inch to one inch lower than the end of the finger and only a little farther rearward than said end, will make it conform to this requirement. This downwardly-projecting flange A^4 , it will thus be seen, serves a purpose which has heretofore in similar constructions been accomplished by causing the cord-arresting finger to overhang the rear side of the breast-plate, or some projection forward therefrom. By avoiding this latter construction I am able to cast the breast-plate in one piece, which that construction prevents, and also ease the action and diminish the strain on the cord. The finger A^3 is vertically expanded at its base or junction with the body of the breast-plate by a downwardly-projecting rib a^{30} , and tapers vertically toward its point—that is, the said rib a^{30} diminishes in vertical dimension from base to point of the finger. The foregoing description has no reference to the flange or bead along the margin of the slot A^2 , which may be extended across the base of the finger, as illustrated. This vertical expansion and taper of the finger has a tendency to cause the cord pressed against and folded under and vertically partly around the finger by the incoming grain to slide over toward the point of the finger, or, what is more to the purpose, toward the plane of the knotter-bill spindle. In some respects this is a more desirable means of accomplishing this result than the deflecting edge a^3 , whose horizontal obliquity to the plane of the needle has the same tendency.

The holder-segments E are formed at opposite ends of a cross-head e' , having the hub E' at the center, by means of which the cross-head and holder-segments are secured to the spindle e . The segments are curved about the axis of the spindle and extend each for about ninety degrees and are directly opposite each other, leaving, therefore, equal opposite intervals between them. The holder revolves in the same direction as the bill, being actuated by the gear-segment C' on the cam-wheel C , which meshes with the pinion E^2 on the spindle e . Said pinion has two delay-surfaces e^2 between its two equal sets of gear-teeth, which correspond to the gear-segment C' on the cam-wheel, and the cam-wheel has the delay-surface C^{10} , supplementing the gear-segment C' and co-operating with the delay-surfaces e^2 of the pinion, so that each revolution of the cam-wheel gives to the pinion, and therefore to the holder, half a revolution, the delay-surfaces on the cam-wheel and pinion, respectively, holding it fixed in position in the intervals between said half-revolutions. The upstanding advance edge e^4 of each of the holder-segments E is slightly oblique to the axis of the holder; but this is not essential. Such obliquity, however, causes said edge to force the cord downward slightly when it encounters it and prevents it from sliding up and escaping the edge. The segments are cut away at the upper edge, commencing just back

of the upper corner of the advance edge and sloping down toward the other edge for about half of the extent of the segment, and then horizontally to the rear edge of the heel of the segment, so that at the heel e^{40} the segment is only about half as high as at the advance edge e^4 . The radius of the segments is only just enough greater than the radius of the hub E' and of the holder-spindle bearing B^2 to leave between the segments and the hub and bearing easy room for the cord. At the position of rest the advance edge of one segment E stands substantially in a plane through the axis of the holder transverse to the plane of the needle's path, so that the said interval between the hub and bearing on the one side and the segment on the other is directly in that path, and the construction of the breast-plate, hereinabove described, consisting in providing the deflected edge a^3 of the needle-cord slot in such position that the needle strikes it and is deflected by it over toward the bearing B^2 , causes the cord to be carried down by the needle close alongside said bearing, and therefore to be unerringly laid into the space between the bearing and the segment.

The holder-clamp E^3 is a spring made of steel plate or sheet cut in the form of the blank shown in Fig. 12, shaped like a letter T, the stem E^{30} constituting the supporting stem or arm of the clamp, while the cross E^{31} is bent about an axis parallel to the stem in the arc of the circle, whose radius is substantially that of the holder-segments E , and the length of the cross E^{31} is such that when thus folded it makes about one hundred and eighty degrees of such circle. The holder-clamp is fastened by the bolt E^{32} to the frame back of the bearing B^2 , the boss b^2 being formed for that purpose, and the upper end of the stem being bent inwardly—that is, toward the axis of curvature of the cross—and a V-shaped notch b^{20} , formed in the frame just above the boss b^2 , affords lodgment for the inbent end of the stem E^{30} , and becomes thus a fulcrum or pivotal stop for the clamp, so that as the bolt E^{32} is screwed in more or less, the clamp is forced more or less closely or with more or less pressure against the holder-segment. The cross E^{31} of the clamp, as well as the stem, being flexibly elastic, but with strong tension, said clamp is adapted to yield away from the holder both by spreading the cross-arm, increasing thereby the radius of curvature, and also to yield by the springing of the stem to permit the cross-arm to move away from the axis of the holder-segments, and in practice the yielding of the stem will correspond quite accurately to the spreading of the cross-arm, so that as the radius of curvature of the cross-arm is increased by such spreading the cross-arm moves out radially with respect to the segments just enough to keep it still concentric with the segments, notwithstanding its increased radius of curvature. The effect of this form of clamp, therefore, is that substantially radial pressure is

exerted upon the holder-segments at all points of the clamp and at all positions of the clamp, as its position may be changed by cord of varying size carried between the segments and the clamp. The edge of the clamp at the inner end of the cross-arm E^{31} is a little forward of the plane which contains the axes of the knotter-spindle and holder-spindle, and has the notch e^{31} with widely-diverging edges to receive the cord and cause it to be guided to the angle or apex of the notch, which thus determines the point from which the cord runs to the bill. The entire operation of this knotter may now be understood. Starting with the end of the cord engaged in the holder between one of the segments and the clamp and folded around the advance edge of the segment, which thus engages it, and back between said segment and the hub of the bearing, and then out either over the upper edge of the heel portion of said segment or around the heel end, it not being material which position the cord assumes, although the latter is the one that will be most frequently assumed, and thence inward over the knotter-bill and over the cord-arresting finger down through the cord-slot in the breast-plate to the eye of the needle. The bundle being accumulated against the cord, the needle, subsequently rising to carry the cord around the bundle, will lay the cord from the spool against the deflecting edge a^3 of the needle-slot, by which it will be guided, as hereinabove described, rearward and will rest on the cord-arresting finger, while the needle, still advancing, will encounter said deflecting edge a^3 and will be sprung over laterally toward the bearings B^2 and B^3 , against which it will rest while it continues to advance, and, being thus held over against said bearings, will lay the cord close alongside the bearing B^2 , down into the space between the bearing and hub of the holder and the high advance end of the segment E , the cord resting across the top edge of said segment back of the higher portion which constitutes the advance end. The needle has now come home. The binder-shaft now starting, the knotter-bill first begins to revolve and wrap the cords which lie across it around the jaws of the bill, carrying them off the finger and around the end of it in the deflected portion A^{20} of the cord-slot. The bill, it will be observed, will in this portion of its rotation overhang for some distance the portion of the breast-plate which bounds the said deflected portion A^{20} of the slot at the rear side, so that the cords between the bill and the bundle will in this path of rotation of the bill be forced onto the bill by the rear edge of the slot as the bill revolves past the same. Just after the bill starts the gear-segment C' engages the holder-pinion and starts the holder and the holder-segment E , between which and the hub or bearing of the holder the cords were laid, as described, advances its upstanding advance edge against the cord,

which extends from the needle to the bill lying between the segment and the bearing or hub, and carrying said cord into the notch e^{31} of the clamp e^{31} . This position of the parts is shown in Fig. 4. The segment, farther advancing, folds the cord around the said advance end and carries it between the segment and the clamp. This segment now therefore holds both cords between it and the clamp. The knotter-bill during its revolution, now almost completed, has first drawn from the bundle as much cord as the bundle would yield for the purpose of forming the knot, and the remainder of what it needed it has obtained by drawing the holder-cord—that is, the end of the cord which was held in the holder at the commencement of the operation—through the holder, taking at the same time a substantially equal amount from the spool-cord, which it has drawn through the eye of the needle, and after the cords are crossed on the bill all the cord drawn by the bill must come through the holder; but the revolution of the bill is by that time nearly finished and a little further movement causes the jaws, which have been opened in the customary manner during the rotation of the bill thus far, to receive between them the two cords running from the holder, and after the cords are thus engaged in the bill a slight remaining portion of the rotation of the knotter-bill causes it to strain the cords tight between it and the holder and to close the bill onto the cords, the tension being the utmost that the detaining friction of the holder upon the cords can produce, and, the knotter having now reached its position of rest, the holder, still revolving and letting the cords draw through it as necessary, carries one of the knives F' of the cutter against the strained cords and severs them both between the bill and the holder and the knot is ready to be completed by being pulled off by the bundle, and the holder comes to rest with the segment which at the commencement was occupied in holding the end of the cord in the position which the other segment occupied at the commencement, and the cord running from the advance edge of the segment which has been passing under the clamp and is now substantially wholly covered by it around between said segment and the hub or bearing of the holder to the opposite side of said hub or bearing, and then out between the hub or bearing and the upstanding corner of the other segment to the eye of the needle. The needle, now retiring, carries back the cord with it and lifts it out of the space between the forward holder-segment E and the bearing and lays it upon the upper jaw of the bill, and thence further retiring lays it upon the cord-arresting finger A^3 , where it is supported while the needle fully withdraws to the position of rest. The cord, having a guide-eye H' on the needle as near as possible to its axis and having another guide-eye H^4 on the frame at such position that the guide-eye H' moves

somewhat away from the eye H^1 on the frame during the retiring movement of the needle, will not be slacked during this movement, but will be held taut when it is laid onto the upper jaw of the bill, and will therefore close that jaw, thus dispensing with the springs or other devices heretofore employed for that purpose. The cord is of course kept taut by the pressure of the bundle when the needle advances, so that it is at all times in condition to hold the bill closed, except as the latter is forced open by the cam on the spindle-bearing at the proper time.

In order to make it certain that the cord as it is drawn back by the receding needle around the heel of the holder-segment shall not escape out of its proper position, though it may slip up over the heel and rest against the clamp, said clamp is extended up into the recess or notch b^4 in the frame B, the projection b^{40} of the frame extending down past the upper corner of the holder-clamp at that point, so that the cord can by no means pass the edge of the clamp, even though it should pass the heel of the holder-segment, and this edge of the clamp is sloped back to the notch e^{31} , so that the cord, if it should slip off the heel of the segment onto the edge of the clamp, would by said sloping edge be guided down and rest against said heel at its upper corner, and this position is a suitable one for the operation. The breast-plate is cut out underneath the holder, the opening A^5 at that point exposing and giving access to the nut, which clamps the cutter onto the holder-spindle, so that the cutter can be readily removed for sharpening, and also permitting the free escape through the breast-plate of the severed cord ends which the holder drops.

It should be observed that the cross-head which connects the segments E, and by which they are fastened to the spindle, has only the width of the hub and bearing of the spindle, and that the entire space within the circle defined by the outer faces of the segments E, between the radii which define the ends of said holder-segments, and outside of the circle which bounds the hub or bearing, is entirely open vertically, so that there is no lower or horizontal web of any sort between the proximate ends of the two segments upon which the ends of the cord might lodge. The peripheral extent of the segments—that is, the extent of their clamping-faces measured in the arc of their rotation—may be greater or less. The greater this extent the more reliable the action of the holder and the less severe the tension of the clamp necessary to insure reliable action. The maximum amount of cord which could by any possibility be left as an end to be cut off beyond the knot is determined by the distance from the notched edge of the clamp to the position of the advance edge of the segment when it comes to rest against the clamp, for the knife revolving very near to the clamp—not more than a quarter or three-eighths of an inch from it—of

course determines the cutting-point with reference to the holder, and the cord from the edge of the knife extends to the notch of the clamp and then around inside the clamp and between it and the segment to the head or advance edge of the segment, and when the needle has retired and laid the cord around the edge of the clamp there is in the holder of cord which would form an end if none should be drawn out in the process of making the knot, a length double the distance from the notched edge of the clamp to the advance edge of the segment in the clamp plus twice the distance of the knife from the inner edge of the segment. The tension of the clamp should be adjusted, however, so that at least half of this cord will be drawn through the holder in the process of drawing the knot. The end should not be released from the segment which holds it at the commencement of the knot until it has been well engaged by the other segment, which happens when said last-mentioned segment carries the spool-cord under the clamp just after the position shown in Fig. 4. This requisite determines the maximum useful extent of the clamp—viz., such fraction of a circle as the circumferential distance between the advance edges of consecutive segments which, when the segments used are two, is one hundred and eighty degrees. If the cord is released from one segment immediately after it is engaged by the next the cord end will then have a length a little more than the cord which would connect the advance edges of consecutive segments—that is, when there are two segments, a little more than the diameter; but part of this cord will be subsequently drawn from the holder during the finishing and tightening of the knot, so that when it is cut off, the tension of the clamp being as it should be and is adapted to be adjusted, the cord end will be about equal to the peripheral extent of the segment-face, which is about an inch and a half, and this end, it will be observed, will at the moment of cutting lie between the segment-face and the clamp and will be carried out from under the clamp and dropped during the formation of the next knot, and, being entirely upon the outside of the segment, will drop freely from the same and fall through the opening A^5 in the breast-plate.

It will be observed that the position of rest of the holder is such that the edge of the segment from which the cord departs toward the bill, which substantially coincides with the receiving edge of the clamp, is removed from the vertical plane of the incoming cord or plane of the needle's path toward the vertical plane of the knoter-bill, so that the rotation of the holder causes the advancing edge of the segment which encounters the incoming or needle cord to carry that cord toward the plane of the knoter-bill axis, as is desirable in order to assist in wrapping it on the bill, or at least carry it as far up on the bill as desirable; and, since the operation of this holder

is designed to be such that both the holder-cord and the needle-cord shall occupy the same interval between consecutive segments and be carried together to the clamp, this interval must be greater than the distance between the two cords as they stand related after the needle-cord has been laid in place and before the holder starts. This necessitates a comparatively wide interval between the proximate edges of consecutive segments, and since, as pointed out, the holder-cord must not be released from the clamp by one segment before it is engaged with the clamp by the next segment it is essential that the clamp should have a circumferential extent greater than said interval (since this interval is the measure of the distance which the holder will rotate after it starts before the advancing edge of the segment will commence to engage the cord with the clamp) and must be sufficiently greater than this interval, so that after a segment covered by the clamp has revolved the distance of the interval it will still be covered by the clamp far enough to hold the cord as firmly as necessary at that stage, the stage of the operation in question being that which terminates in the position seen in Fig. 4, while the knotter-bill is making the first three-quarters of its revolution. Practically I have found that it is necessary to have the clamp extend a distance about equal to the extent of one segment and one interval—that is, the circumferential distance from the advancing edge of one segment to the advancing edge of the next following segment.

I claim—

1. In a cord-knotter, the knotter-bill, combined with the breast-plate having a cord-slot and a cord-arresting finger protruded from one side of the slot underneath the bill, said slot being deflected to extend around the end of the finger, the point of the finger being elevated above the opposite margin of the slot sufficiently to cross a line drawn from the lower edge of the opposite margin to the point where the cord rests on the knotter-bill and terminating in close proximity to the vertical plane of said opposite margin, but not projecting past said plane.

2. In a cord-knotter, the knotter-bill, combined with the breast-plate having the cord-slot and the cord-arresting finger protruded from one side of the slot underneath the bill, said slot being deflected to extend around the end of the finger and being unobstructed vertically throughout the whole deflected part and having its margin at said deflected part opposite the end of the finger vertically expanded to bring the lower edge of such expanded margin below the point of the finger sufficiently to make a line drawn from that lower edge to the point where the cord rests on the knotter-bill cross said finger, substantially as set forth.

3. In a cord-knotter, the breast-plate having the cord-slot and the cord-arresting finger protruded from one side of the slot at the end

of the knotter-bill, said finger being provided with a rib a^{30} projecting from its lower side, said rib tapering from the base to the point of the finger, substantially as and for the purpose set forth.

4. In combination with the knotter-bill, the holder located beyond the bill constructed and arranged to have the point of departure of the cord therefrom toward the bill at that side of the plane of the incoming cord which is toward the axis of the bill, such holder consisting of similar cylindrical segments arranged to be revolved as a unit about their common axis of curvature and circumferentially separated by intervals greater than the distance between the plane of the incoming cord and the point of departure of the cord from the holder, and mechanism which rotates the holder turned to bring the same interval from which the holder-cord runs in the path of the incoming cord, whereby both the holder-cord and the incoming cord may occupy the same interval between consecutive segments, substantially as and for the purpose set forth.

5. In combination with the knotter-bill, the holder located beyond the bill constructed and arranged to have the point of departure of the cord therefrom toward the bill at that side of the plane of the incoming cord which is toward the axis of the bill, such holder consisting of similar cylindrical segments arranged to be revolved as a unit about their common axis of curvature and circumferentially separated by intervals greater than the distance between the plane of the incoming cord and the point of departure of the cord from the holder, whereby both the holder-cord and the incoming cord may occupy the same interval between consecutive segments, the clamp pressing upon the outside only of such holder and covering greater extent of the circumference than the interval between consecutive segments, substantially as and for the purpose set forth.

6. In combination with the knotter-bill, the holder located beyond the bill constructed and arranged to have the point of departure of the cord therefrom toward the bill at that side of the plane of the incoming cord which is toward the axis of the bill, such holder consisting of similar cylindrical segments arranged to be revolved as a unit about their common axis of curvature and circumferentially separated by intervals greater than the distance between the plane of the incoming cord and the point of departure of the cord from the holder, whereby both the holder-cord and the incoming cord may occupy the same interval between consecutive segments, the clamp pressing upon the outside only of such holder and covering the circumference substantially to the extent of one segment and one interval, substantially as and for the purpose set forth.

7. In a cord-knotter, a holder clamp or shoe of spring metal bent in the arc of a circle and

adapted to spread elastically in the plane of such arc and having an elastically-yielding stem extending from near the middle of the curved part and secured at a distance therefrom, whereby the curved part is adapted, also, to yield bodily away from its axis of curvature, substantially as set forth.

8. In a cord-holder, the holder clamp or shoe formed of a T-shaped blank of spring metal, the stem of the T being secured to the frame and the cross thereof bent in the arc of the circumference of the holder with which said clamp co-operates, substantially as set forth.

9. In a cord-holder comprising cylindrical segments constructed and arranged to be revolved about their common axis, the binder-arm arranged to lay the cord across the circumferential path of rotation of such segments in the interval between two consecutive segments at one side only of a plane containing the axis of the holder and transverse to the plane of the binder-arm's movement, and a fixed clamp pressing elastically against the outside only of the segments, substantially as set forth.

10. In a cord-knotter, in combination with the holder comprising cylindrical segments constructed and arranged to be revolved about their common axis, a clamp or shoe consisting of a spring bent in the arc of the outer circumference of the holder-segments and having a spring-stem extending from the middle of such arc and secured at a distance from the holder, substantially as set forth.

11. A cord-holder comprising two similar cylindrical segments located upon opposite sides of their common axis of curvature, and the cross head or bar extending across said axis to connect them and arranged to be rotated about their said axis, the angular interval between said segments in the cylindrical space in which they are located being unobstructed throughout the whole height of the segments and their connecting cross-heads, substantially as set forth.

12. A cord-holder consisting of two cylindrical segments located upon opposite sides of their common axis of curvature and rigidly connected together across said axis and arranged to be rotated thereabout, and a clamp consisting of a spring bent in a half-circle having substantially the radius of said segments constructed and arranged to press

yieldingly against and yield bodily radially away from the outer face of said segments, substantially as set forth.

13. In combination, substantially as set forth, the binder-arm and the breast-plate having the cord-slot through which the binder-arm enters, said slot having one edge deflected across the path of the needle near the knotter-bill, the needle being constructed and arranged to encounter said deflected edge and be deflected thereby at the closing portion of its advancing stroke.

14. In a cord-knotter, the binder-arm and the breast-plate having the cord-slot through which said arm enters, said slot having one edge deflected across the path of the binder-arm, said binder-arm being constructed and arranged to encounter said deflected edge and be deflected thereby toward the latter part of its advancing stroke, combined with a knotter-frame on the opposite side of the breast-plate from that from which the arm enters, located and arranged to arrest the lateral movement of the needle caused by its encountering the deflected edge of the breast-plate slot, substantially as set forth.

15. In combination, substantially as set forth, the holder, the knotter-bill, and the binder-arm, said binder-arm having a cord-guide eye near its axis, and a fixed cord-guide eye on the frame nearer to said guide on the binder-arm when the latter is farthest advanced than at any other part of its path, whereby the retreat of the needle tends to take up slack from the cord to cause it to be drawn taut across the bill to close the same, substantially as set forth.

16. In combination with the breast-plate having the apertures a' a' , and the horizontal seats located outward from said apertures, the bundle-strippers G' and G^2 , consisting of rods having the offset ends and shoulders described and engaged in said apertures, said rods being lodged in said seats, extending outward and then bent up and attached to the frame, substantially as set forth.

In testimony whereof I have hereunto set my hand, at Springfield, Ohio, in the presence of two witnesses.

ANDREW STARK.

Witnesses:

HARRY I. PROTZMAN,
MORTON G. BAIRD.

It is hereby certified that in Letters Patent No. 465,436, granted December 15, 1891, upon the application of Andrew Stark, of Chicago, Illinois, for an improvement in "Cord Knotters for Grain Binders," an error appears in the printed specification requiring the following correction, viz.: In line 86, page 6, the word "turned" should read *timed*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 22d day of December, A. D. 1891.

[SEAL.]

CYRUS BUSSEY,
Assistant Secretary of the Interior.

Countersigned:

W. E. SIMONDS,
Commissioner of Patents.