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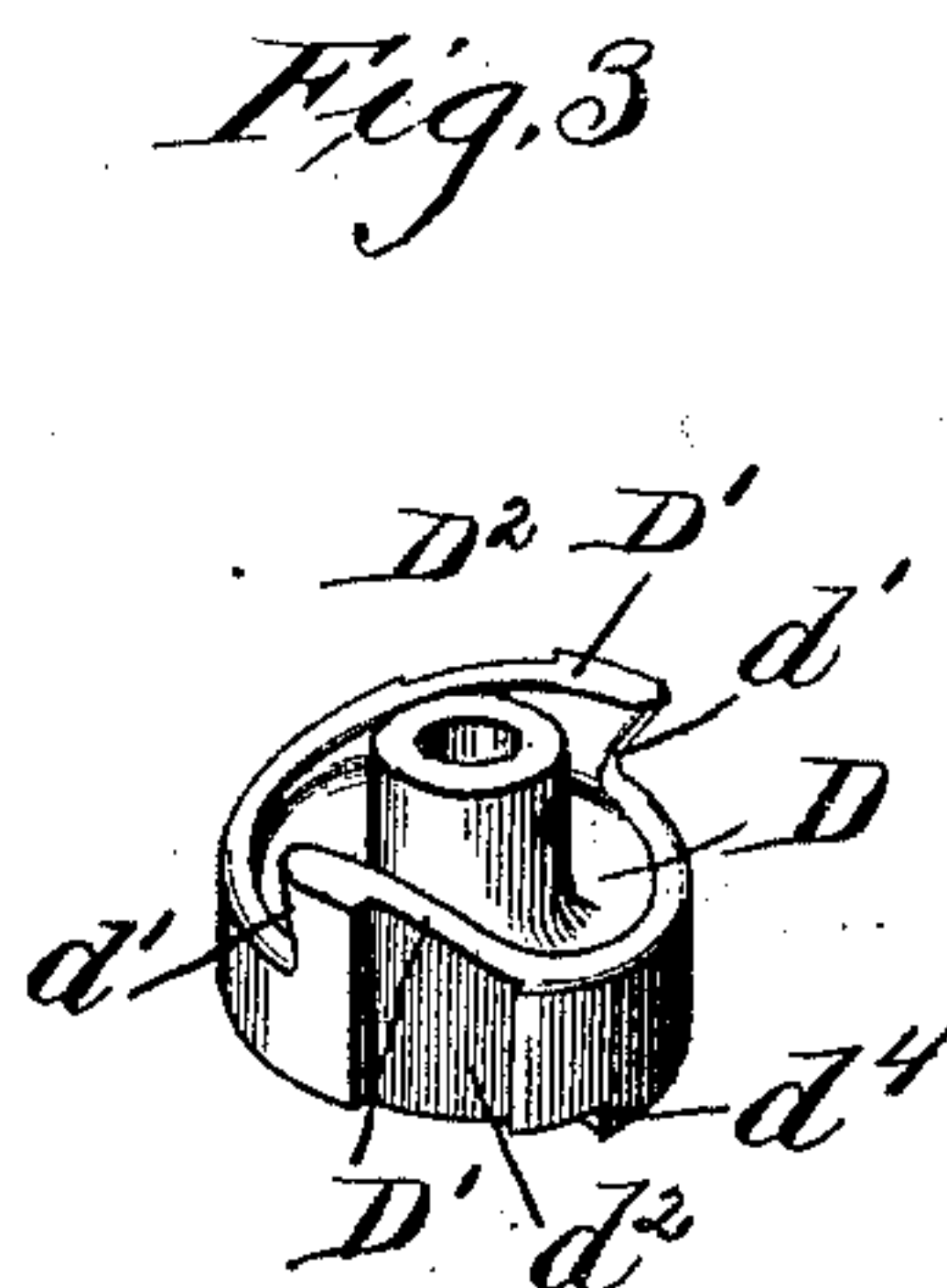
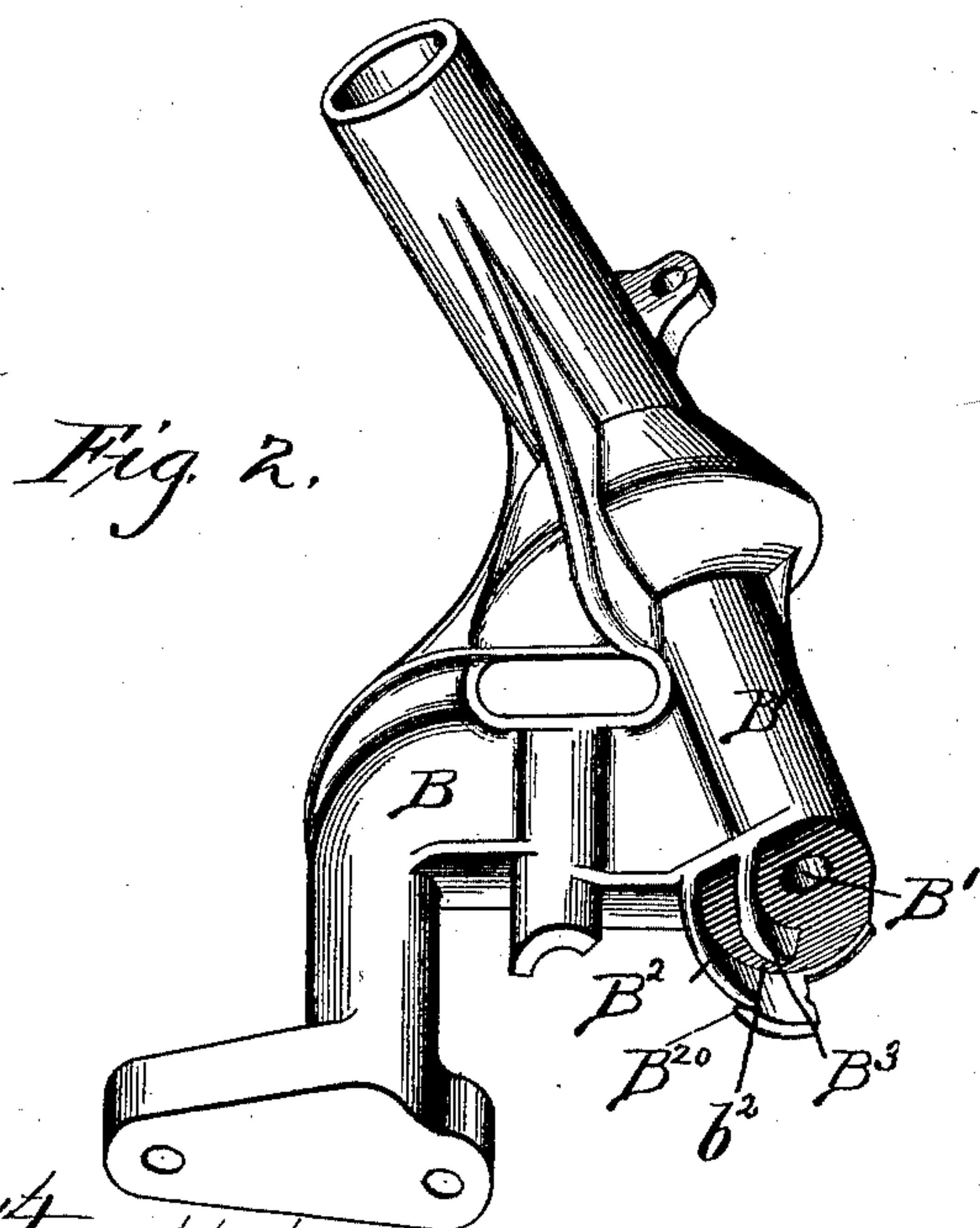
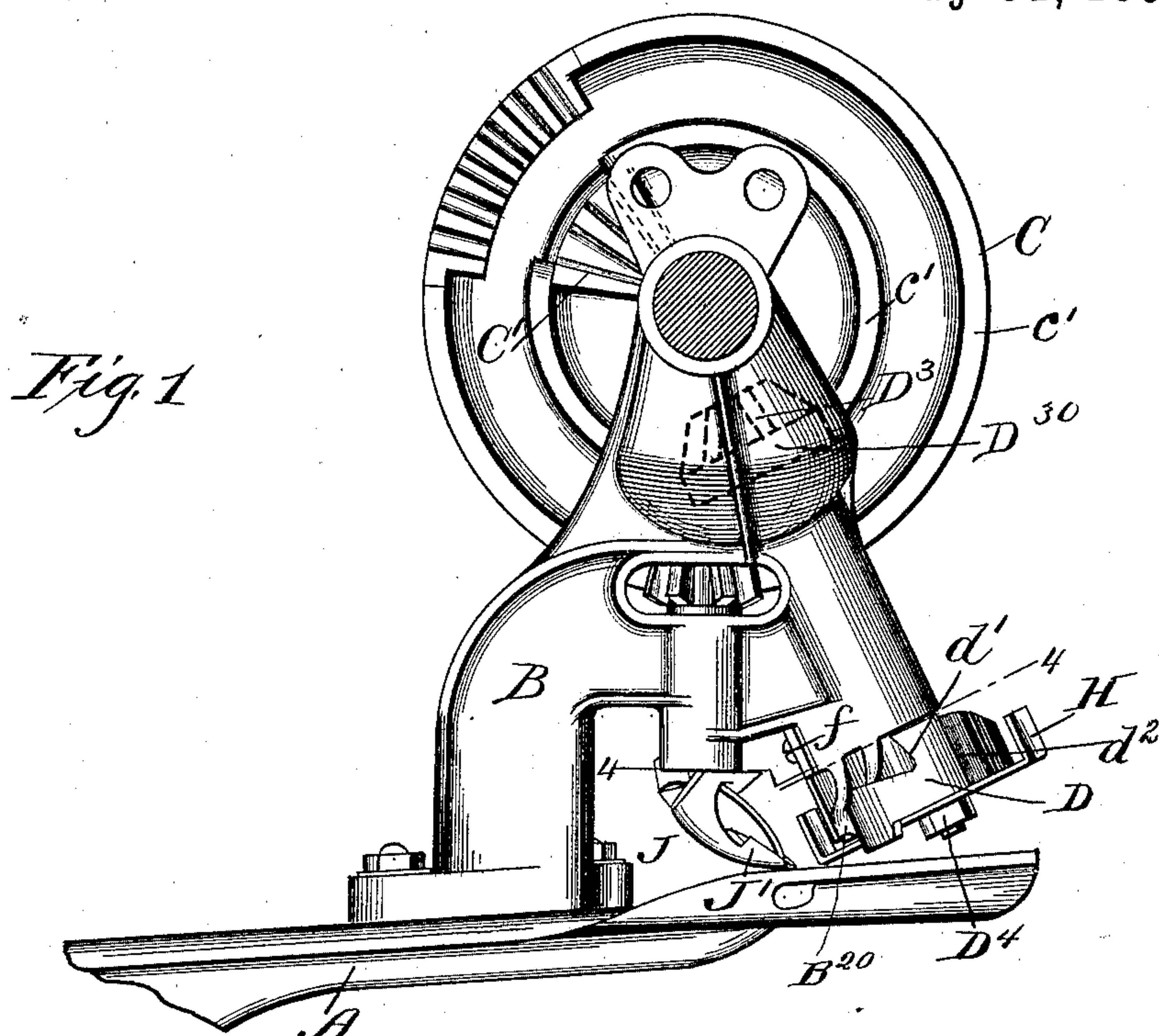
4 Sheets—Sheet 1.

A. STARK.

CORD KNOTTER FOR GRAIN BINDERS.

No. 475,821.

Patented May 31, 1892.



Witnesses
Martin H. Olsen.
Jean Christ.

Inventor
Andrew Stark
By *Burton^{tho} Burton*
his attorneys

(No Model.)

4 Sheets—Sheet 2.

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Fig. 4

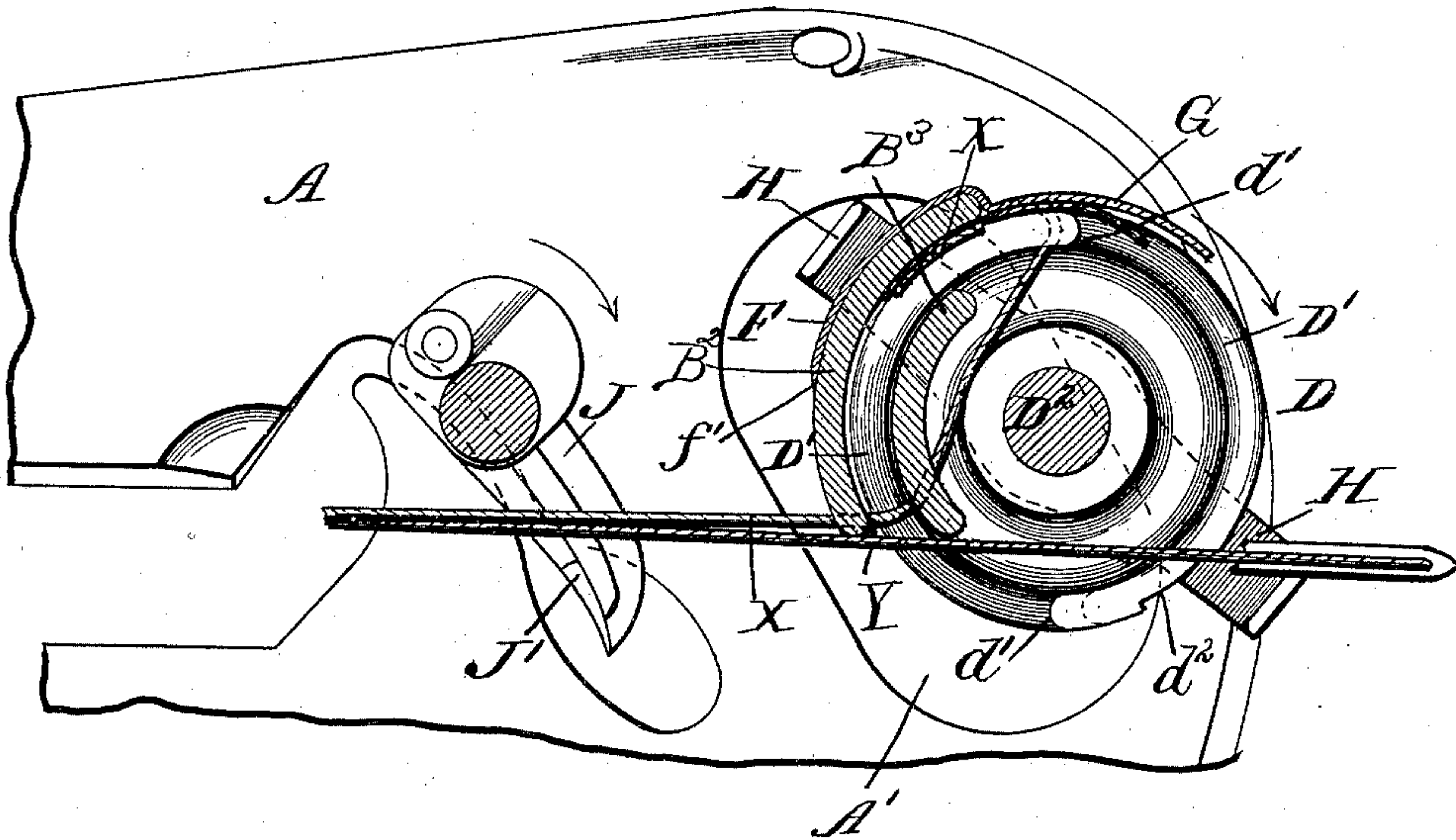
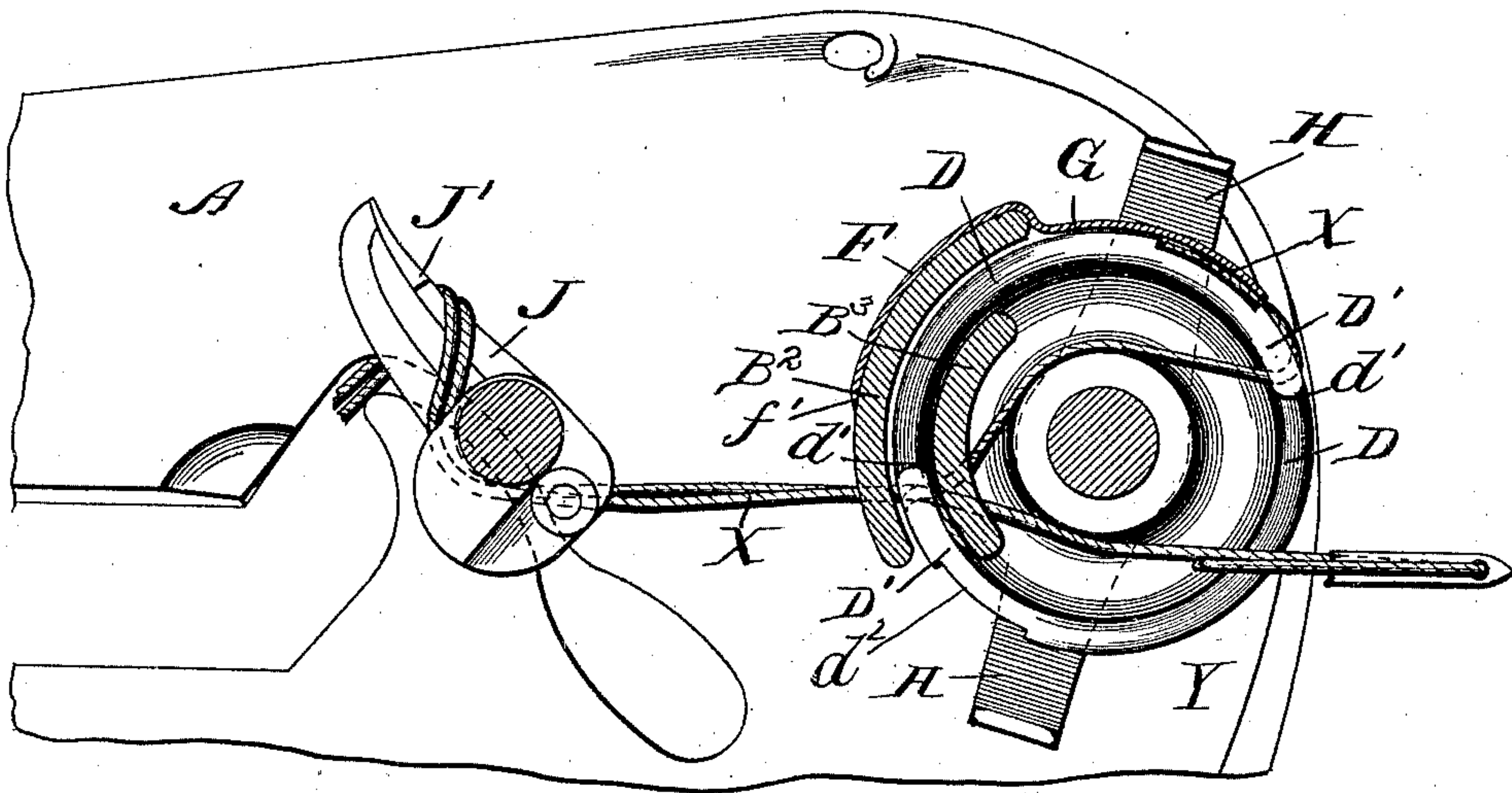


Fig. 5



Witnesses
Martin A. Olsen
Jean Ellis

Inventor
Andrew Stark
By Burton & Burton
his attorneys

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Fig. 6

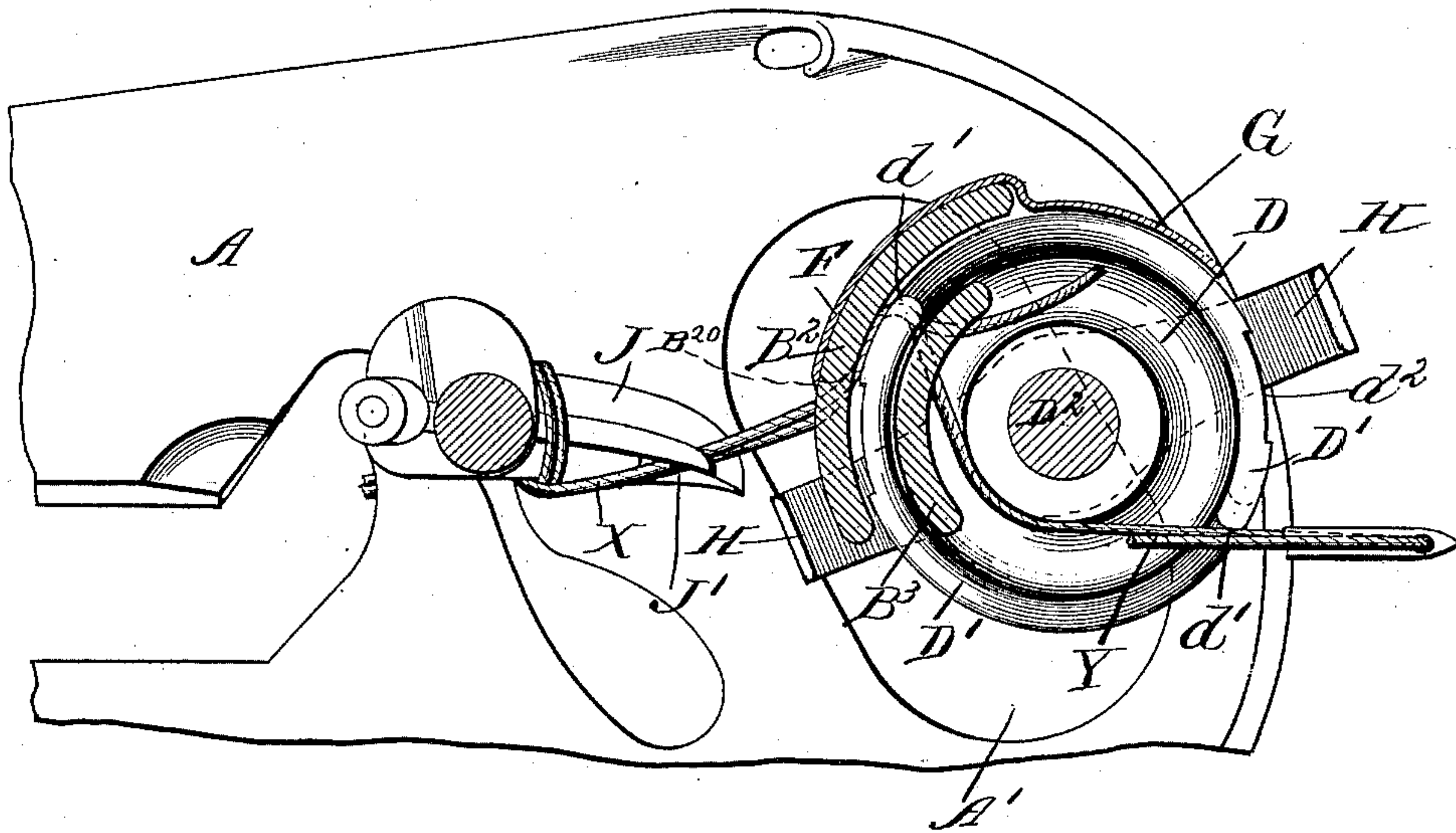
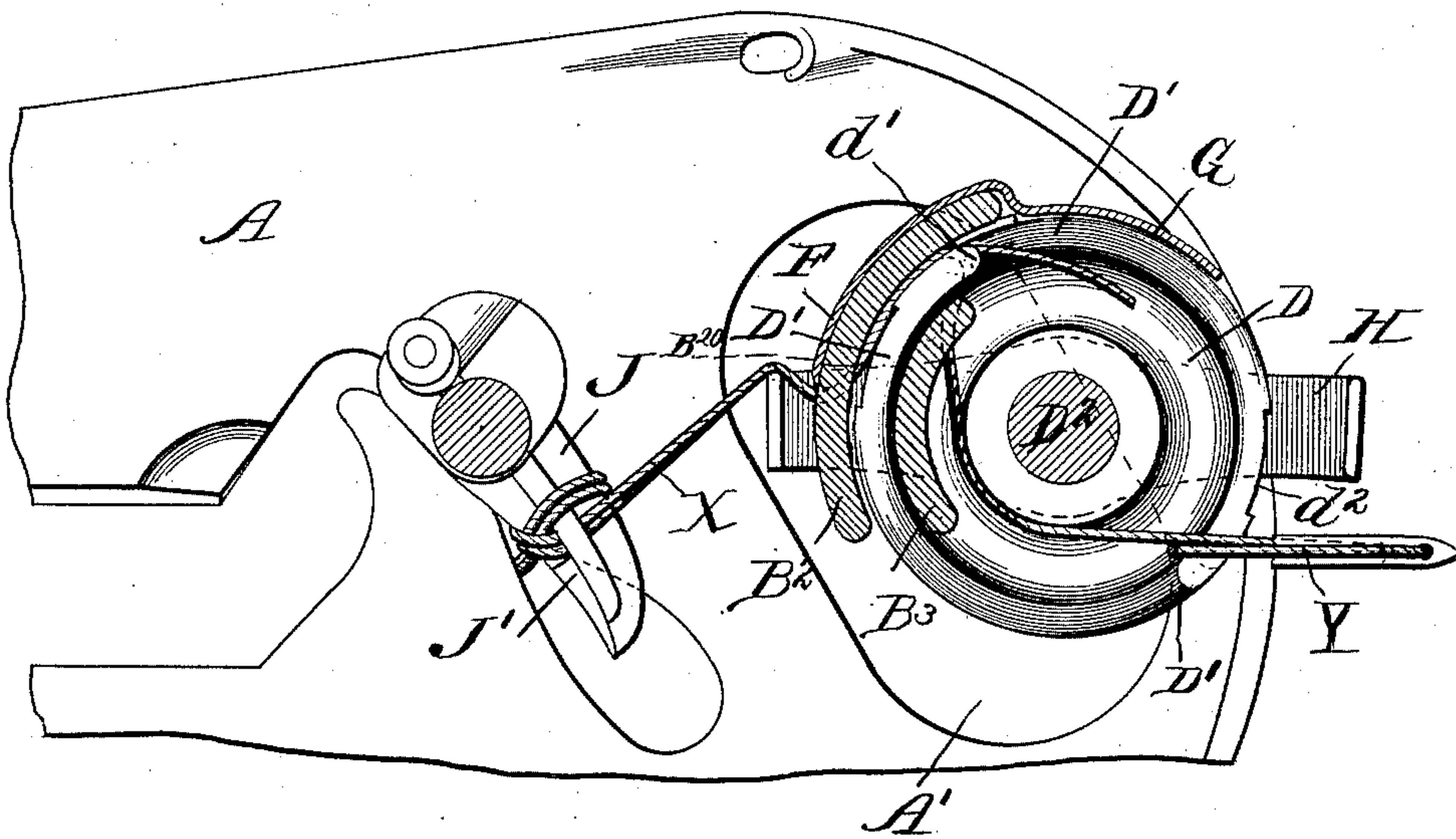


Fig. 7



Witnesses
Martin H. Olsen.
Jean Elliott.

Inventor
Andrew Stark
By Burton W. Burton

(No Model.)

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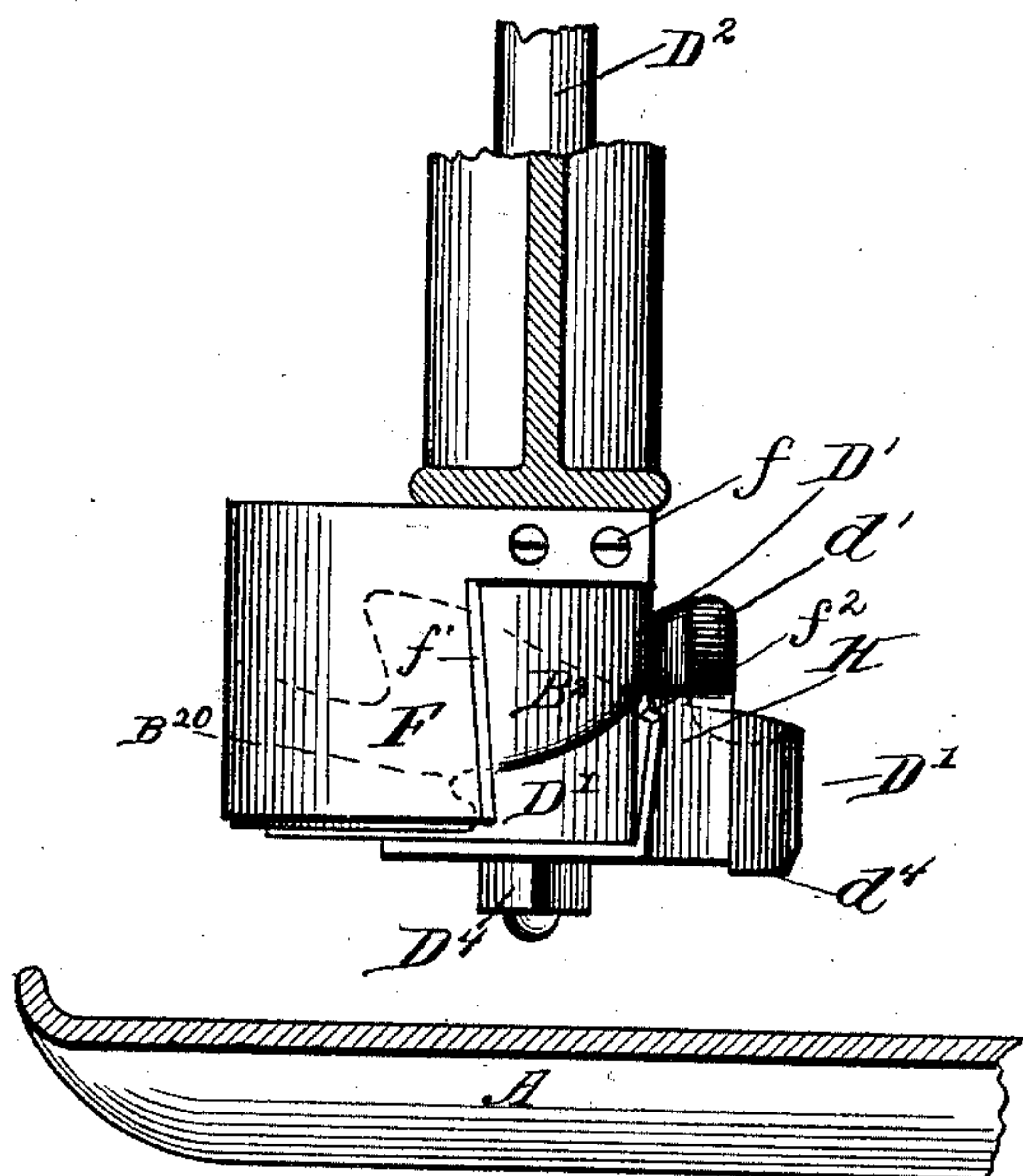


Fig 8.

Witnesses
Martin H. Olsen.
Jean Elliott

Inventor:
Andrew Stark
By Burton W. Burton
his attys

UNITED STATES PATENT OFFICE.

ANDREW STARK, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF TO THE
WARDER, BUSHNELL & GLESSNER COMPANY, OF SPRINGFIELD, OHIO.

CORD-KNOTTER FOR GRAIN-BINDERS.

SPECIFICATION forming part of Letters Patent No. 475,821, dated May 31, 1892.

Application filed October 17, 1891. Serial No. 409,062. (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 are fully set forth in the following specification, reference being had to the accompanying drawings, forming a part thereof.

In the drawings, Figure 1 is a front elevation of a knotter-frame with the knotting mechanism therein, the driving-shaft being shown in section and the breast-plate partly broken away. Fig. 2 is a perspective of the knotter-frame with all moving parts detached. Fig. 3 is a perspective of the cord-holder disk. Fig. 4 is a sectional plan, section being at the planes indicated by the broken line 4 4 on Fig. 1, of the knotter-bill and cord-holder, showing the parts in the position just prior to starting of the knotter-bill and holder. Fig. 5 is a similar plan showing the parts in the position occupied after the knotter-bill has made about half its revolution in forming the knot. Fig. 6 is a similar view showing the parts in the position at which the knotter-bill receives the cord between its jaws. Fig. 7 is a similar view showing the parts in the position occupied at the instant of cutting the cord, the knot being on the bill ready for completion by stripping it off. Fig. 8 is an elevation of the holder and adjacent portion of the knotter-frame, looking from the side at which the knotter-bill stands, the parts being about in the position shown in Fig. 6.

A is the breast-plate.

B is the knotter-frame.

C is the knotter-actuating wheel.

D is the holder-disk.

F G is a steel plate, of which the part F is a knife, and G a yielding clamp, which assists in holding the cord.

H is an arm which operates (being rigid with the holder-disk) to force the cord into the knotter-bill and against the knife.

The knotter-bill J is constructed substantially like the bill shown in my patent, No. 457,169, dated August 4, 1891, having the spur

J' on its lower or fixed jaw at the advance side of the vibrating jaw, which has the specific purpose set forth in that patent.

The holder-disk D is of a type commonly known as a "crown" disk-holder or cup-holder or cylindrical segment-holder. The holder illustrated, having two segments D' D', with intervals or notches in which the cord is laid, is adapted to make a half-revolution for each knotting operation. The advancing edges d' d' of the segments D' D' are slightly undercut to enable them more certainly to hold the cord which they engage.

D² is the holder-spindle, whose bearing in the frame B is shown at B' and which has at its upper end the customary beveled pinion D³, which is engaged by the segment-rack C' on the knotter-actuating wheel C and given one-half a revolution for each engagement and held in fixed position in the intervals of such half-revolutions by the delay-surfaces D³⁰ and c' on the pinion and knotter-actuating wheel, respectively. At the lower end of the bearing B' of the holder-spindle there is formed integral with the frame B the holder-saddle comprising the two concentric ribs B² B³ and the intervening channel b², said ribs and channel being in concentric arcs about the axis of the holder-spindle, the radius of the arc of the channel being that of the holder-flange, so that when the holder is put in position with its spindle in its bearing said flange is adapted to revolve through the saddle—that is, to pass between the ribs B² B³ in the channel b². This saddle is situated on that side of the axis of the holder which is in general toward the knotter-bill axis. Both the ribs B² B³ diminish in height at their forward sides, being the sides at which the holder-segments enter the saddle as the holder revolves, so that said ribs present sloping front edges to the entering holder-segments. The outer rib B² is longer in the direction of the axis of the holder than the inner rib at its rear portion, the forward portion, however, being cut away to about the same height or length as the inner rib, and at the point where it is thus cut away there is formed a shoulder which is also recessed, so that it becomes a

notch B²⁰. This notch is a little rearward of an imaginary line connecting the axes of the holder and the knotter-bill spindles.

The plate F G is secured to the frame rigidly by the screws *f* on the side of the holder-bearing which is toward the knotter-bill and just above the plane of the saddle. It is bent around outside of the saddle to the extreme rear edge of the latter and then folded inward—that is, toward the axis of the holder-spindle—so that it will bear upon the holder-flange as the holder revolves and extends on around in contact with said flange for a distance of nearly sixty degrees. Except at the portion at the forward end where the plate F G is made fast to the frame B, its width vertically is such that it extends down to the plane of the bottom of the holder and it is abruptly expanded downward from the narrower portion, where it is secured to the frame at a point just outside of the notch B²⁰ in the saddle, making there an abrupt shoulder, which is given a cutting-edge *f'* and makes of that portion of the plate a knife F. This knife is therefore rigid with the frame, although the remaining portion of the plate, having no fastening to the frame beyond the screw *f*, which is near to the knife-edge and being elastic, is capable of being forced slightly away from the holder at the portion G, which bears upon the holder-segments, and is therefore of the nature of a yielding clamp and has the function of a clamp, as will hereinafter appear. The holder has rigid with it two of the arms H, corresponding to its two segments, and they are preferably made, as shown, of a single piece of metal, which extends across the bottom of the holder and is secured by the nut D⁴, which secures the holder to its spindle, and is stopped and compelled to revolve, as rigid with the holder, by the lugs *d'* *d'* on the under side of the holder, and is unbent at the ends at a point which causes them to pass successively outside of the knife as the holder revolves. These unbent ends extend higher than the notch B²⁰, where in their revolution they pass outside the notch in passing outside the knife. Their advance edges are preferably cut away from a point just below the upper corner, so that they are slightly retreating from the base up to that point where a slight shoulder *f*² is formed facing downward, and the cutting-edge of the knife is also slightly beveled or made retreating from the lower edge upward, these features serving the purpose of giving an oblique cut to the cord by causing it to slide on the knife as it is strained against it, but are not absolutely necessary.

The operation of this mechanism is as follows: The holder-cord X at the conclusion of each complete knotting operation will be left at the position in which it is shown in Fig. 4, and the description will therefore proceed from that point, presuming that the cord will in some manner have been caused to engage with the holder, as shown in that figure—that is to say, the end being be-

tween one of the holder-segments D' and the outer rib B² of the saddle and extending thence around the advancing edge *d'* of the holder-segment back across the holder on the side of the hub toward the knotter-bill, thence out toward the knotter, passing in front of the sloping ends of both the ribs B² and B³, under which, on account of their slope, it will be drawn somewhat while it passes up over the edge of the holder-segment between the ribs, so that it will be slightly pinched and gripped between the holder-segment and the saddle-ribs, particularly the inner rib B³, on account of the comparatively acute angle which they make as they extend past each other at that point, which may be called the "mouth" of the holder. The advancing end portion of the segment, around which the cord is folded as described, is at this stage—that is to say, at the position of rest of the holder—being pressed on its outer surface by the clamp-spring G, so that the cord, without regard to whether or not it is very tightly grasped between the clamp and the holder-segment, will at least be rendered taut, as it extends from the end of the holder-segment across the holder past the hub to its lodgment under the saddle-ribs and over the edge of the segment at the holder-mouth, and being thus rendered taut the sharp turns which it is compelled to make in passing the saddle-ribs and the holder-segment, particularly in view of the sharp angle between them, as stated, will cause it to be very tightly held at the holder-mouth, so that it will not yield to any important extent while the bundle is being packed against the cord. The spool-cord Y, after the bundle is accumulated, being laid into the mouth of the holder—that is, in front of the upstanding shoulder *d'* of the segment about to come into action—lies substantially alongside the spool-cord at the holder-mouth, but is not drawn tightly into it, because, instead of running back around the inner saddle-rib, as does the holder-cord, it runs to the eye of the needle. The two cords being in this position (seen in Fig. 4) the knotter-bill and the holder start about the same time, their rotary motion being in the same direction about their respective axes, as shown by the arrows in Fig. 4, and the upstanding edge *d'* of the segment in front of which the spool-cord was just laid advances into the saddle—that is, between its ribs—and engaging both the cords at the saddle-mouth pushes them on before it, causing both to slide down on the sloping edges of the ribs, so that they are more securely held than before at this point. By the time the advancing edge of the segment has carried the cords far enough under the saddle, so that they are securely held thereby, the other segment around whose end the end of the holder-cord was folded and held by the clamp G will have advanced to the position shown in Fig. 5, where that end of the cord is about to be released, a notch or recess *d*² in the outer face of the segment deep enough

for the end of the cord to lie in without being tightly pinched being at this stage just about to pass the edge of the spring, so that the end of the cord is now beyond the grasp of the spring. The holder-cord, therefore, from this stage on is held only in the saddle. Up to this point it may be presumed that whatever cord has been needed by the knotter-bill has been drawn from the bundle, although if it should be drawn slightly through the holder no harm will result. If the bundle does not yield the cord required, both cords will yield to some extent, but not easily through the saddle, not being positively clamped therein, but only restrained by reason of being compelled to double back and forth around the edges of the saddle-ribs and around the upstanding edge of the holder-segment between the proximate surfaces of the segment and ribs, respectively, and between the bottom of the holder and the under surface of the rib B³. If the holder is adapted to the cord employed, the holder end of the cord by the time the knotter-bill reaches the position shown in Fig. 6 will be as represented in that figure, and it should be noticed that by that time both cords running from the bill have been lodged in the notch B²⁰ of the outer saddle-rib B² and that the upstanding edge of the operating-holder segment has passed that notch, carrying the cords before it, so that both cords are of necessity now pinched between the proximate surfaces of the outer saddle-rib and the holder-segment holding the cord more nearly in a positive manner than at any point prior to this in the knotting operation. At this stage the cords have entered between the jaws of the bill, the upper jaw is just about to close, and while the knotter is revolving from the position shown in Fig. 6 to that shown in Fig. 7, which is the position of rest, the closing of the bill permitting the cords wrapped around the bill to slide slightly toward the point, as they could not do while the jaw was held open, has yielded what little cord was needed, and at the same time the strain put upon the cord by the continued rotation of the holder drawing the cords into it has operated forcibly to close the knotter-bill, and just after the position shown in Fig. 6 the upstanding end of the arm H reaching the cords between the bill and the holder has forced the cord into the position shown in Fig. 7, accomplishing two purposes—first, to crowd the knot back on the bill, or, more correctly speaking, to hold it back and prevent it slipping forward, insuring that cords just entered between the bill are forced back over the spur J' and lodged behind it in the bill, and, second, to fold the cord over the knife-edge and cause the cord to be strained against it, eventually causing the cords to be severed.

Fig. 7 is intended to represent the position of the cord just prior to or at the instant of cutting. The cords having been severed at substantially this position the holder con-

tinues to revolve, carrying the severed ends into the saddle and the advancing end of the segment out of the saddle to the spring-clamp G and coming to rest with the parts and cords in the position shown in Fig. 4. The fag end of the cord cut off and occupying the position illustrated in Fig. 4 will be dropped out in making the next knot before reaching the position shown in Fig. 6, and will generally fall outside the breast-plate; but if it chances to lodge on the breast-plate will readily escape through the aperture A' without becoming entangled in the mechanism.

I claim—

1. In combination, substantially as set forth, a crown disk or segmental cord holder, a co-operating cord-clamp fixed with relation to said holder where the cord is received and adapted to yield to the pressure of the cord at the part adjacent to which the advance portion of the holder-flange stands at rest in the intervals between complete knotting operations.

2. In combination, substantially as set forth, a cord-holder having upstanding segmental flanges, a cord-clamp adapted to co-operate with such flanges in driving and holding the cord, a cord-driver H, rigid with the cord-holder and revolving with it outside the clamp, and a knife rigid with the holder-bearing, having its cutting-edge between the clamp and the path of said cord-driver, substantially as set forth.

3. In a cord-knotter, in combination, substantially as set forth, the knotter-frame, the holder-saddle rigid with said frame, and the holder adapted to be revolved through the saddle, and an elastically-yielding clamp operating against the holder after its emergence from the saddle.

4. In a cord-knotter, in combination, substantially as set forth, the knotter-frame, the crown disk or cup holder having its shaft journaled therein and the saddle rigid with the shaft bearing at the end thereof and integral therewith and adapted to receive the holder-flange between its wings as the latter revolves, and an elastically-yielding clamp secured to the frame in position to press upon the outer surface of the holder-flange after its emergence from the saddle.

5. In a cord-knotter, in combination, substantially as set forth, the knotter-bill, and the crown disk or cup holder revolving in the same direction about their respective axes, the saddle rigid with the bearing of the holder-shaft at the side toward the knotter-bill, the holder-flange adapted to revolve through such saddle, the knife rigid with the bearings of the holder-shaft outside the saddle, and the arm H, rigid with the holder and having the cord-engaging finger H' upstanding outside the knife.

6. In a cord-knotter, in combination, substantially as set forth, the knotter-bill and the crown disk or cord holder revolving in the same direction about their respective

axes, the saddle rigid with the holder-shaft bearing on the side toward the knotter-bill, having its outer wing or rib provided with the cord-arresting notch B²⁰, located on the
 5 side of the plane of the axes of the bill and holder opposite to the plane of the path of the needle, and the mechanism which rotates the knotter-bill timed to bring it to rest at
 10 the completion of the knot with its jaws on the opposite side of the plane of said axes from said notch and pointing away from said plane.

7. In a cord-knotter, in combination, substantially as set forth, the knotter-bill and
 15 the crown disk or cup holder revolving in the same direction about their respective axes, a clamp rigid with the bearings of the holder-shaft on the side thereof toward the knotter-bill, mechanism which revolves the knotter-
 20 bill timed to bring it to rest after its jaws have passed the position of greatest proximity to the holder, and the holder having a rigid arm H, extending across the clamp and provided with the upstanding finger outside the
 25 latter in position to engage the cord running from the bill to the holder, whereby it forces such cord into the knotter-jaws as the latter complete their rotation.

8. In a cord-knotter, in combination, substantially as set forth, the knotter-bill and
 30 the crown disk or cup holder, mechanism which revolves them in the same direction

about their respective axes, the saddle rigid with the holder-spindle bearings on the side thereof toward the knotter-bill, and the knife
 35 also rigid with said bearings outside the saddle, the holder having the arm H rigid with it and provided with the finger H', upstanding in position to revolve outside the knife, the knotter-bill-driving mechanism being timed
 40 to cause the bill to finish its rotation after passing the point of greatest proximity to the holder-axis, whereby the upstanding finger H' folds the cord over the knife and strains it away from the knotter-bill. 45

9. In combination, substantially as set forth, the crown disk or cup holder, the saddle rigid with the bearings of the holder-spindle in position to permit the holder-flange to revolve through it, and the plate F G, also
 50 rigid with the holder-spindle bearings, having the knife-edge near to the point of its rigid fastening and having the part G remote from said fastening and beyond the saddle, whereby it is adapted to press elastic-
 55 ally upon the holder-flange after the latter emerges from the saddle.

In testimony whereof I have hereunto set my hand, at Chicago, Illinois, in the presence of two witnesses, this 6th day of October, 1891. 60

ANDREW STARK.

Witnesses:

CHAS. S. BURTON,
 JEAN ELLIOTT.