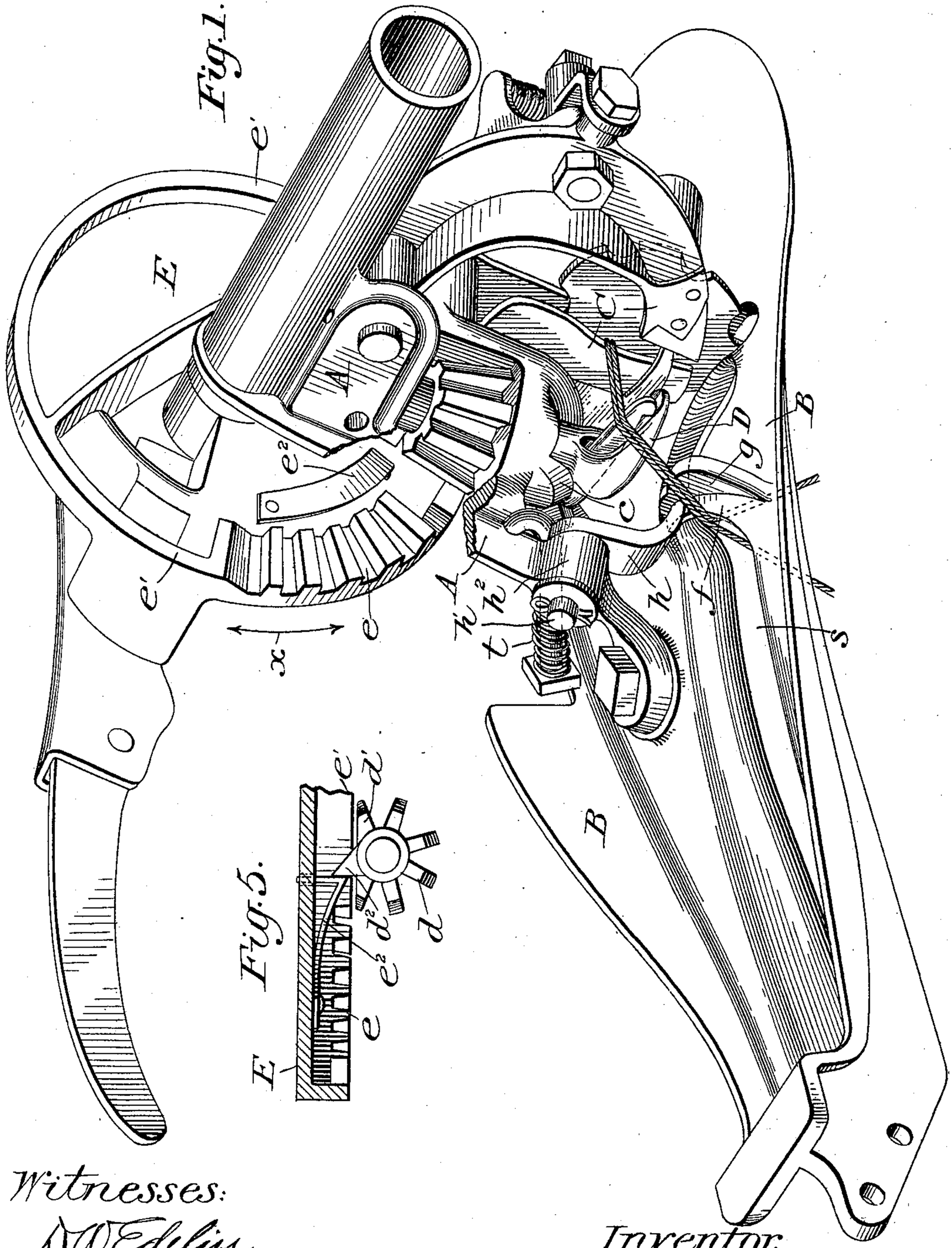
No. 629,522. Patented July 25, 1899.

C. A. A. RAND.

KNOTTING DEVICE FOR GRAIN BINDERS.

(Application filed Apr. 25, 1898.)

(No Model.) 3 Sheets—Sheet 1.



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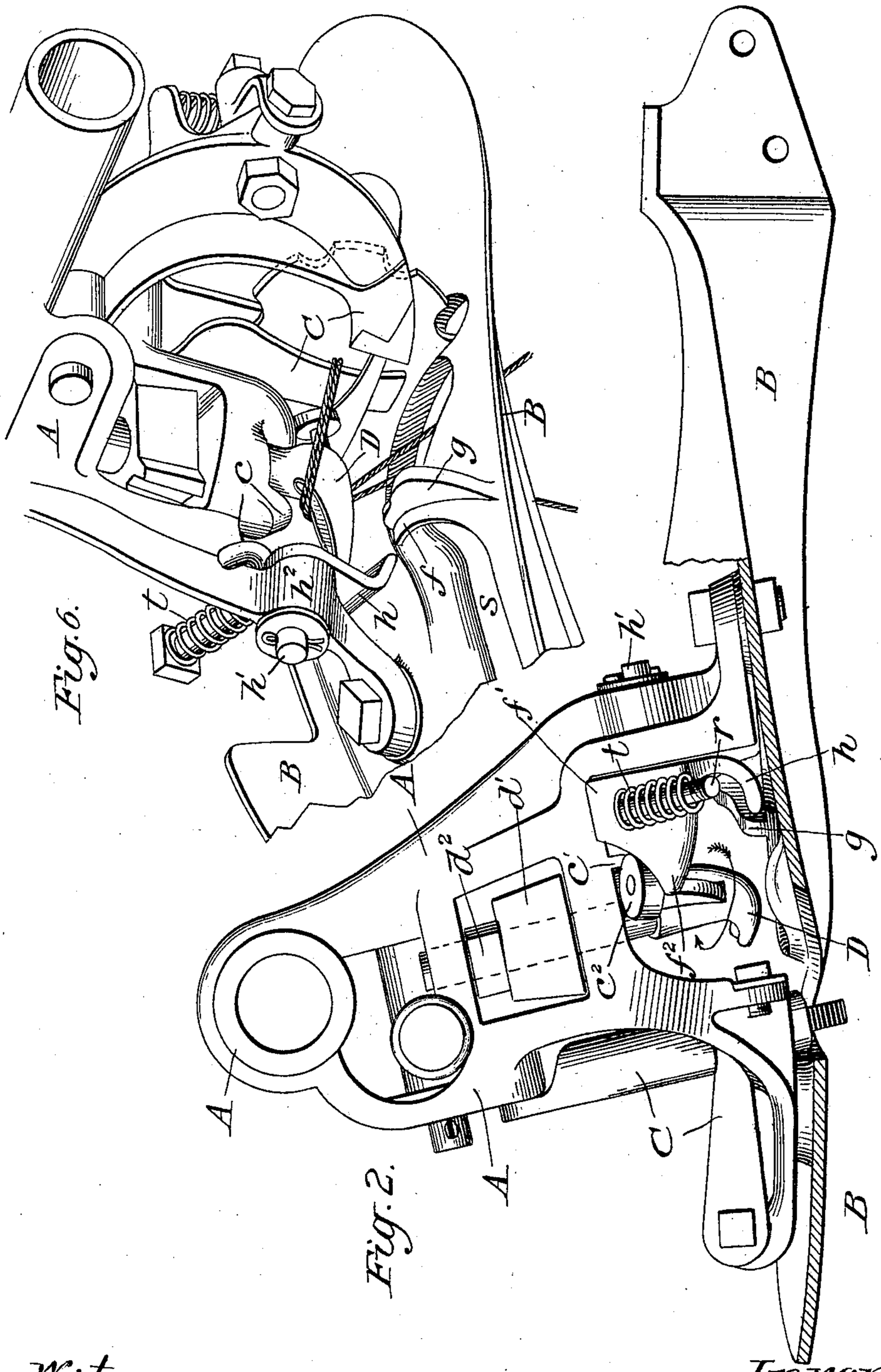

Fig. 6.

Fig. 2.

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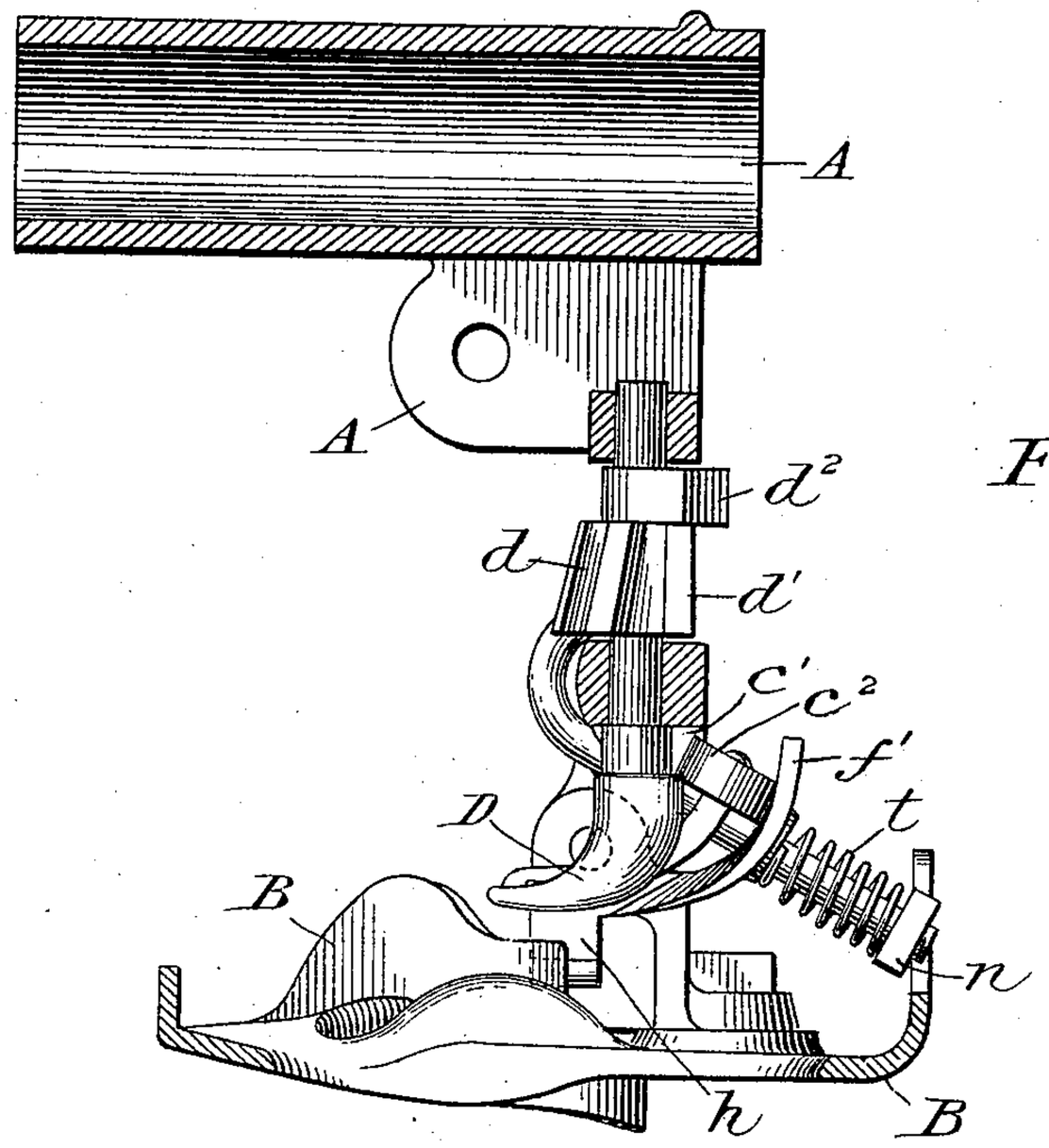

Fig. 3.

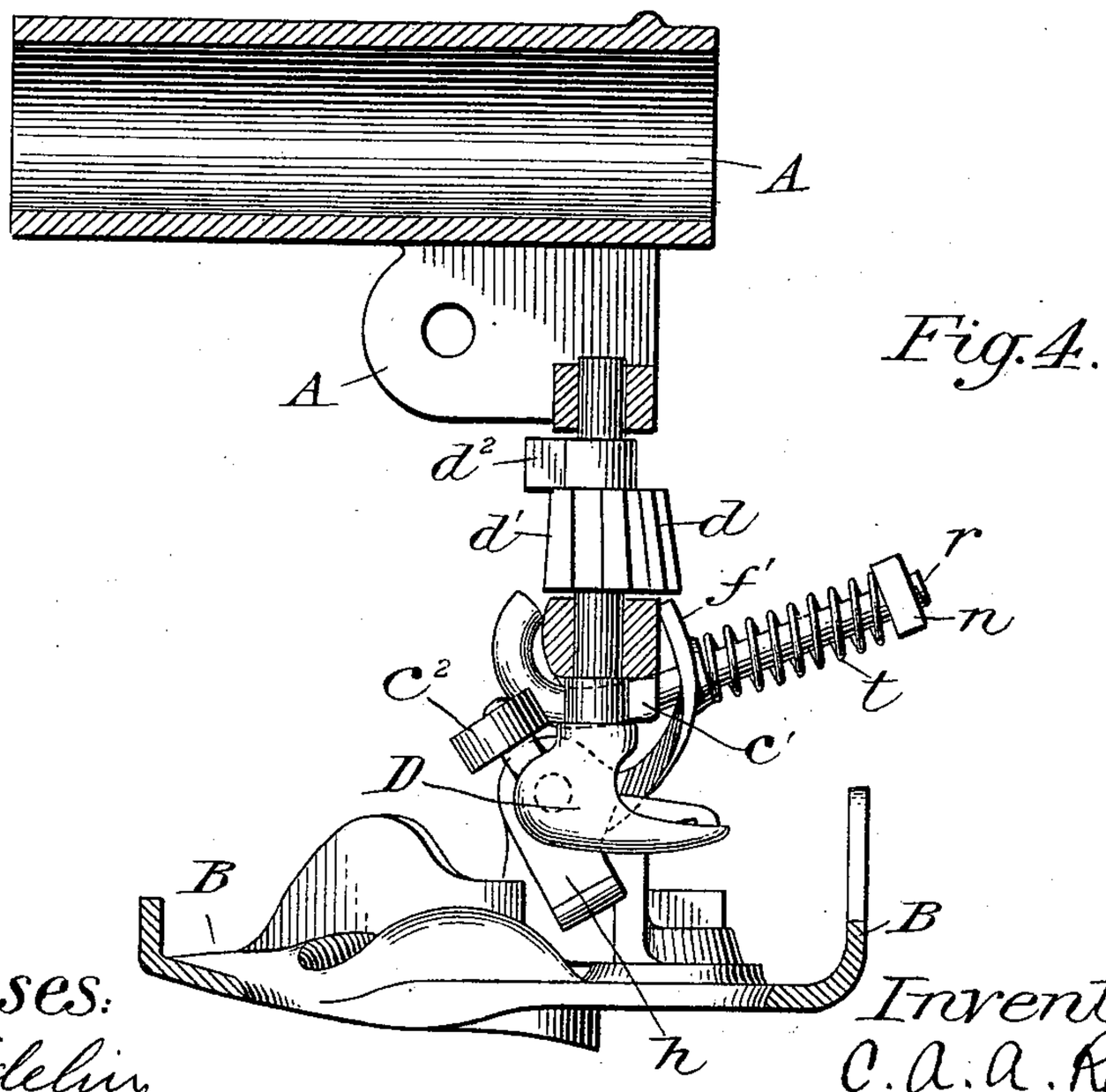

Fig. 4.

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UNITED STATES PATENT OFFICE.

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KNOTTING DEVICE FOR GRAIN-BINDERS.

SPECIFICATION forming part of Letters Patent No. 629,522, dated July 25, 1899.

Application filed April 25, 1898. Serial No. 678,810. (No model.)

To all whom it may concern:

Be it known that I, CHARLES A. ANDERSON RAND, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Knotting Devices for Grain-Binders, of which the following is a full description, reference being had to the accompanying drawings.

The invention relates to the knot-forming mechanisms of grain-binders and in part especially to a type of comparatively recent introduction where, although the knotter itself rotates in one direction only, the knotter-operating gear is oscillated back and forth; and the invention has for its objects to provide a novel form of latch or gate for the needle-slot in the breastplate and an improved manner of operating the same and timing its movements with respect to the knotter and to provide an improved construction and arrangement of the knotter, its operating-gearing, and its jaw-operating cam relatively to one another, so that the proper engagement of the knotter-pinion with its tooth-segment may be insured on the forward movement of the operating-gear and so that the knotter will not be turned on the reverse movement of the gear, but will be positively held against any backward rotation which might result from the return of the operating-gear or the pull of the twine.

The best embodiment of the invention at present known to me is illustrated in the accompanying drawings and which, without intending to limit myself to the details of construction thereof, I will now describe and claim.

In the drawings, Figure 1 is a perspective view of the entire knotter mechanism as seen from a point diagonally above the same. Fig. 2 is an elevation looking in the direction of the operating-wheel shaft from the position of the wheel, which is removed; and Figs. 3 and 4 are sectional views taken lengthwise the wheel-shaft, just outside the knotter, which is shown in the cord-receiving position in Fig. 3 and as having made about half a rotation in Fig. 4. Fig. 5 is a sectional fragment of the rim of the knotter-operating wheel; and Fig. 6 is a perspective view similar to Fig. 1, but showing the position of the parts and the cord when the gate is open.

The frame A of the knotter, the breast-plate B and its slot, and the cord holding and cutting mechanisms C form no part of the invention and may be of any convenient form and construction. The details of these parts will be readily identified in the drawings and will not, therefore, be further referred to.

The knotter D is of the type which stands normally pointing slightly outward and which makes only one revolution in the formation of the knot. It is journaled in the frame in the usual manner and provided with the usual pinion *d*. The knotter-operating wheel E is mounted, as usual, on the shaft from which the frame is suspended; but the shaft and wheel are not rotated in this instance, but are oscillated, as indicated by the arrow *x* in Fig. 1. Such oscillating wheel and shaft are not broadly new, and I have not, therefore, deemed it necessary to illustrate any means for operating them.

The knotter-wheel E is provided with a gear-segment *e*, with which the knotter-pinion intermeshes, and the segment and pinion may have any approximate number of teeth for giving the knotter the one complete rotation already referred to, the usual relation being one less tooth in the segment than in the pinion. The wheel is further provided with a delay-rim *e'*, running around it from one end of the segment to the other, and the pinion has a delay-shoe *d'* coöperating with the rim *e'*, said shoe and rim coöperating to stop and to hold the knotter stationary when the pinion and segment are not actually intergeared.

For the purpose of insuring the prompt and complete engagement of the pinion with the segment on the forward movement of the knotter-wheel I provide the wheel with a starting-tooth e^2 a little in advance of the segment *e'* and on a slightly-shorter radius, and I also form on the knotter-spindle, just above the pinion *d*, a supplemental tooth d^2, having such angular relation to the other teeth of the pinion that when struck by the starting-tooth on the knotter-wheel it will cause the pinion to fairly and quickly engage the segment *e*.

On reference to Fig. 5 it will be noted that the advancing side of the starting-tooth e^2 presents an abrupt shoulder and that the side of the supplemental tooth d^2 of the pinion is about at a right angle to the face of the delay-shoe d'. Although not essential to the successful operation of the parts, this is a desirable construction. It is essential, however, that one of the teeth should be yielding in order that the knotter may not be turned back when the wheel E is reversed, for it will be understood that if the teeth d^2 and e^2 are rigid and engage each other in both movements of the wheel the knotter would also be oscillated. The most convenient way to provide for this is to make the tooth e^2 yielding, and Fig. 5 shows a simple form of the same, consisting in a flat spring riveted to the wheel at one end and bent at an angle at its tooth end and having its point passed into an opening in the wheel. It will now be understood that the end of the spring forming the starting-tooth e^2 engages one side of the tooth d^2 as the wheel E moves forward and that the supplemental tooth will not be engaged at all by the spring as the wheel E is reversed until near the end of the spring is reached, when the opposite side of the tooth d^2 is engaged. I therefore preferably make this side of tooth d^2 at an obtuse angle to the face of the delay-shoe and gradually incline the other side of the spring-tooth e^2, as shown in Fig. 5, so that on the backward movement of the wheel E the parts may slide easily past each other and the spring-tooth yield without starting the pinion d into engagement with the opposite end of the segment e. Although with this construction and arrangement of parts the knotter-pinion would not be reëngaged with the segment e on the return of the oscillating wheel E, there would be some liability of such reëngagement, due to the jarring of the machine and the unavoidable friction between the parts. Moreover, at this juncture the pull of the twine on the jaws of the knotter would probably tend to turn it backward. I therefore provide, in combination with this reversing wheel and segment, what is, broadly speaking, a one-way pawl-and-ratchet attachment, and I specifically work out this arrangement by a modification in the form of the cam for opening the jaws of the knotter, as follows: In Fig. 1 the letter c denotes this cam. So far as its function in opening the jaws of the knotter is concerned it is of the usual construction; but I provide its rear end with an abrupt somewhat elongated face or shoulder c'. It will of course be understood that when the roller on the heel of the movable jaw of the knotter (denoted by c^2 in the drawings) runs off the cam c the spring-cam that closes the jaw and the tension on the twine around the jaws cause the roller to immediately close up against the knotter-spindle into the position shown in Figs. 2 and 3. This is the position of the roller when the knotter-operating wheel starts to reverse, and it is held in this position by the pull on the twine and the spring before mentioned. The abrupt shoulder c' of the knotter-jaw cam, however, stands in the path of any backward movement and forms a positive abutment against which the roller c^2 contacts. In this arrangement the knotter-jaw (which is of the usual spring-closed type) may be regarded as and is in effect a spring-pawl and the shoulder at the end of the cam as a ratchet-tooth, and although an ordinary pawl and ratchet might be used for the purpose I prefer to so utilize the knotter-jaw and cam.

I will now describe my improvements relating to the cord-gate. The function of this gate is well understood, and it is to be particularly noted that as its movements must have a certain relation to and correspondence with those of the knotter a characteristic feature of this improvement is that the action of the gate is not only timed with respect to the knotter, but is actually controlled by the knotter itself, whereby all liability of derangement between the movements of the two parts due to the wear of separate actuating mechanisms is obviated and a constant relation preserved.

Referring to Fig. 1, s denotes the slot in the breastplate, the contour and direction of which are not peculiar to the present invention. From the side of the slot opposite the knotter there projects across it and toward the knotter-spindle a finger f. There is nothing new in the arrangement or function of this finger except that I provide it with a vertical flange g to shield the end of the cord-gate and prevent the cords getting under the same. The gate itself is denoted by h. It projects downwardly and then outwardly from a small spindle h', which is journaled in a bearing h^2 on the knotter-frame. Normally the gate stands in the position shown in Fig. 1, with its end lying above and just clearing the finger f near its point and the flange g extending a little above it for the purpose already explained. With the gate in this position, the knotter is in position to receive the cord, and the slot in the breastplate is closed, so that the cord is laid against and supported by the gate h. The gate is normally held in this closed position by the roller on the jaw of the knotter, as will be explained later on. It is opened by a spring t, which bears upon a lateral wing or projection f' of the gate and is adjustable by means of a nut n, screwing on the end of the rod r, which is encircled by the spring and which passes freely through a perforation in the wing f' and hooks around a part of the knotter-frame, as shown in Figs. 1 and 4. Of course any other form of spring for this purpose would be within the scope of my invention. The wing f' extends above the pivot of the gate, as will be noted in Figs. 3 and 4, and projects up on the other side of the knotter-frame from the gate, so that it stands in the path of the roller c^2 on the movable jaw of

the knotter. The wing is also preferably widened out, as shown at f^2 in Fig. 2, for the purpose of utilizing it as the closing-cam for the knotter-jaw. The relative position of all these parts will be readily understood from Figs. 2, 3, and 4, where the different positions of the gate and its wing are shown during the revolution of the knotter. The knotter stands normally, as shown in Figs. 1, 2, and 3, with its roller c^2 against the shoulder c' of the jaw-opening cam c, the roller having just passed off the cam. At this time the roller c^2 presses the wing f' outward and holds the gate closed in the position shown in Figs. 1 and 3. The knotter starts to revolve in the direction of the arrow in Fig. 2, and as soon as its roller passes out from under the portion f^2 of the wing f' the spring opens the gate h and the cords are permitted to be drawn past and around the end of the finger f in the ordinary way. When the knotter has completed its revolution and the knot has been formed, it comes to rest with its roller again under the wing f', and the gate is again closed and held so until both strands of the cord have been fairly laid upon the knotter and the jaws have got sufficient start on their next rotation to make the escape of the cords impossible.

It will be understood that the portion f^2 of the wing of the cord-gate takes the place of the usual jaw-closing cam of the knotter; but so far as the mere closing of the gate by the knotter is concerned any other form of jaw-closing cam might be used. The present arrangement is, however, greatly preferred, as the location of the wing f' of the gate enables it to be utilized for the purpose of closing the knotter-jaws, at the same time simplifying the construction and enabling the knotter to hold the gate closed as long as desired.

Having thus described my invention, what I claim, and desire to secure, is—

1. In a grain-binder, the combination with the slotted breastplate, of a knotter, and a cord-gate for closing the slot and supporting the cords, said gate being separate from but controlled by the knotter.

2. In a grain-binder, the combination with the slotted breastplate, of a knotter, and a cord-gate in advance of the knotter for closing the slot and supporting the cords, said gate being separate from but closed by the knotter.

3. In a grain-binder, the combination with the slotted breastplate, of a knotter, and a cord-gate for closing the slot and supporting the cords, said gate being closed and held by the knotter and opened by a spring when released by the knotter.

4. In a grain-binder, the combination with the slotted breastplate, of a knotter, a cord-gate for closing the slot and supporting the cords, and a jaw-closing cam connected with the cord-gate.

5. In a grain-binder, the combination with the slotted breastplate, and the knotter, of a cam for opening the knotter-jaws, a cord-gate for closing the breastplate-slot and supporting the cords, and a jaw-closing cam connected with the cord-gate.

6. In a grain-binder, the combination with the slotted breastplate, and the knotter, of a cam for opening the knotter-jaws, a cord-gate for closing the slot and supporting the cords, a jaw-closing cam connected with the gate, and a spring for opening the gate and closing the jaws.

7. In a knotter mechanism for grain-binders, the combination of an oscillating wheel having a gear-segment, a delay-rim, and a starting-tooth, of a knotter-pinion having a delay-shoe coöperating with the rim, and a supplemental tooth coöperating with the starting-tooth, the starting-tooth being adapted to pass the supplemental tooth on the backward movement of the oscillating wheel without reversing the knotter.

8. In a knotter mechanism for grain-binders, the combination of an oscillating wheel having a gear-segment, a delay-rim and an elastically-yielding starting-tooth, of a knotter whose pinion is provided with a delay-shoe coöperating with the rim, and a supplemental tooth coöperating with the starting-tooth, said starting-tooth being adapted to engage the supplemental tooth in the forward movement of the wheel, and to yield and pass over the same on the wheel's reverse movement.

9. In a knotter mechanism for grain-binders, the combination of an oscillating gear-segment for rotating the knotter, means for stopping the knotter at the completion of its knot-forming rotation, and mechanism for holding the knotter in that position while the gear-segment is passing it during the reverse movement of the operating-segment.

10. In a knotter mechanism for grain-binders, the combination of an oscillating gear-segment for rotating the knotter, means for stopping the knotter at the completion of its knot-forming rotation, a ratchet-tooth on the knotter-frame, and a yielding pawl carried by the knotter, whereby the knotter is permitted to revolve in a forward direction, and prevented from revolving backward.

11. In a knotter mechanism for grain-binders, the combination with an oscillating gear-segment for rotating the knotter, having a starting-tooth at one end of the segment, and a delay-surface at both ends, of a knotter having a delay-shoe, a supplemental tooth coöperating with the starting-tooth, a ratchet-tooth on the knotter-frame, and a yielding pawl carried by the knotter, whereby the knotter is thrown into gear with the segment on the movement of the latter in one direction, and stopped at the completion of its knot-forming rotation, and prevented from gearing with the segment on the latter's return, and held against reverse rotation.

12. In combination with the slotted breastplate, the cord-gate and the knotter, both suitably supported in positions relative to the

said breastplate, the latter provided with a portion eccentric to its axis and thus adapted to engage the said gate and force it to close the slot in the breastplate, substantially as described.

13. In combination with the slotted breastplate, the cord-gate suitably supported upon the knotter-frame, the knotter provided with an eccentric portion adapted to move the said gate to its closed position, and a spring for retracting the said gate and thus opening the slot in the breastplate, all combined substantially as described.

14. In combination with the slotted breastplate and the knotter-frame, a cord-gate pivoted upon the knotter-frame above the knotter, said gate provided with an extension f^2 adapted to serve as a cam for closing said knotter-jaw, and a spring adapted to move said cam and cause it to elastically hold the knotter-jaws closed, and at the same time open the space in the breastplate, to permit the twine extending from the knotting devices to the bundle to pass downward, substantially as described.

15. In combination with the oscillating segmental gear E provided with the yielding tooth e^2, a cord-knotter shaft free to be revolved in a forward direction, but arrested from movement in a reverse direction, a pinion having a delay-shoe, and the supplemental tooth d^2, substantially as described.

16. In combination with the knotter-pinion having the delay-surface and the supplemental tooth, the knotter-frame having a ratchet-tooth, the knotter-shaft carrying a pawl, and the oscillating segment-gear having the yielding tooth, substantially as described.

17. The combination of the knotter-frame having the cam *c*, adapted to act as a ratchet-tooth, the knotter having its pivoted jaw adapted to act as a pawl, the knotter-pinion having the delay-shoe and the supplemental tooth, and the oscillating segment having the yielding tooth e^2, substantially as described.

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