

(No Model.)

5 Sheets—Sheet 1.

A. M. JENKINS.

GRAIN BINDER.

No. 413,283.

Patented Oct. 22, 1889.

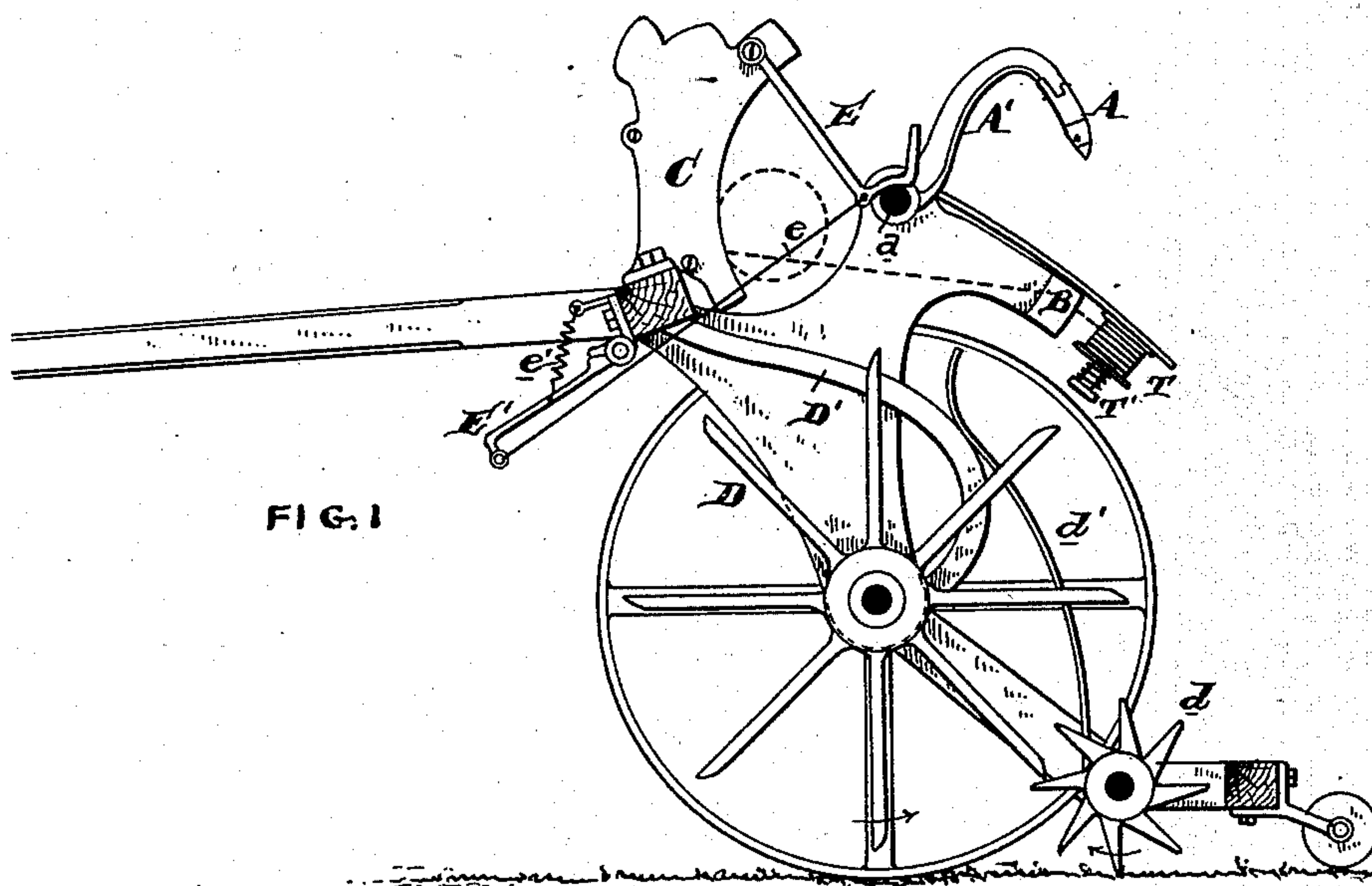


FIG. 1

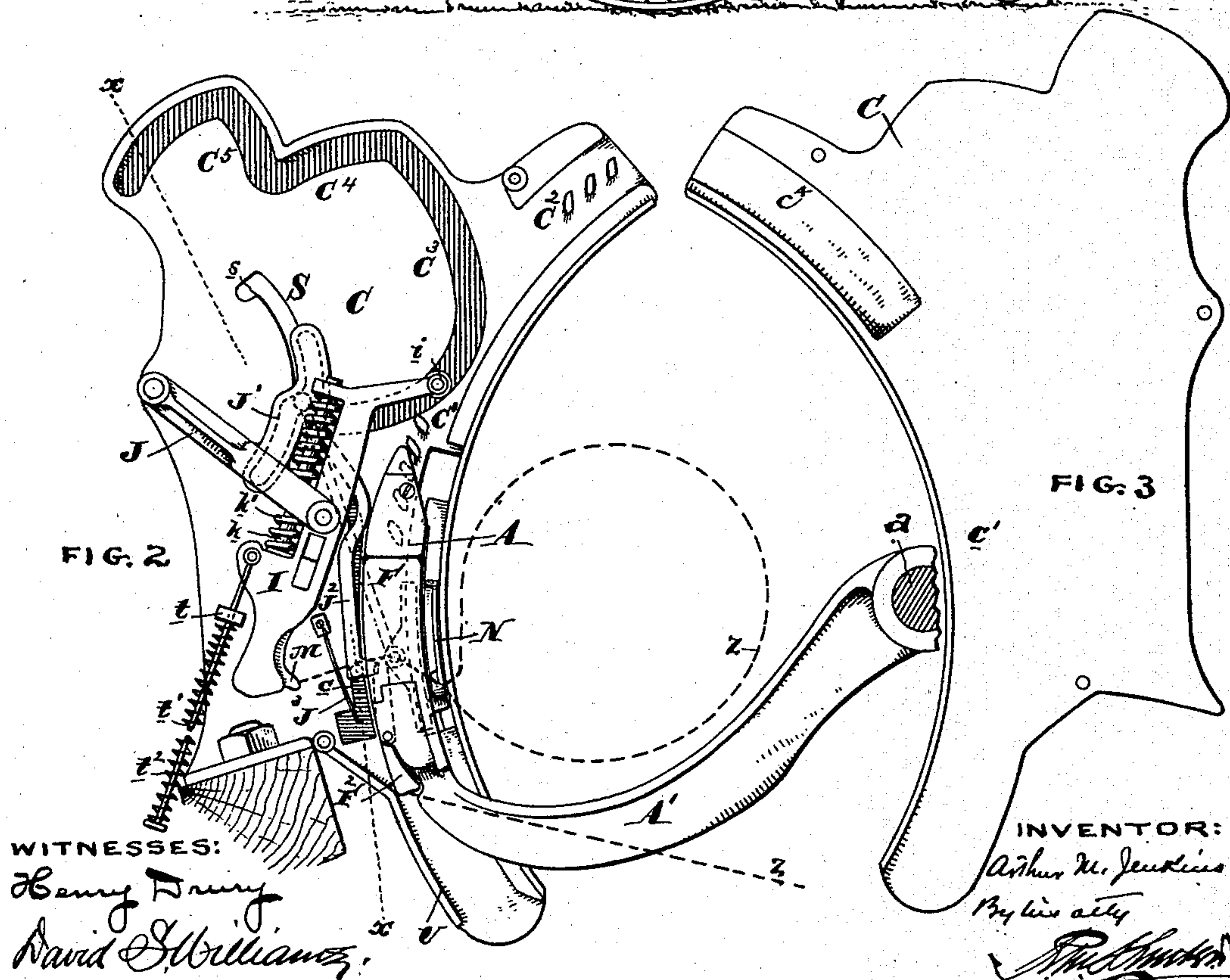


FIG. 2

FIG. 3

WITNESSES:

Henry Drury
David S. Williams

INVENTOR:

Arthur M. Jenkins
By his atty

[Signature]

(No Model.)

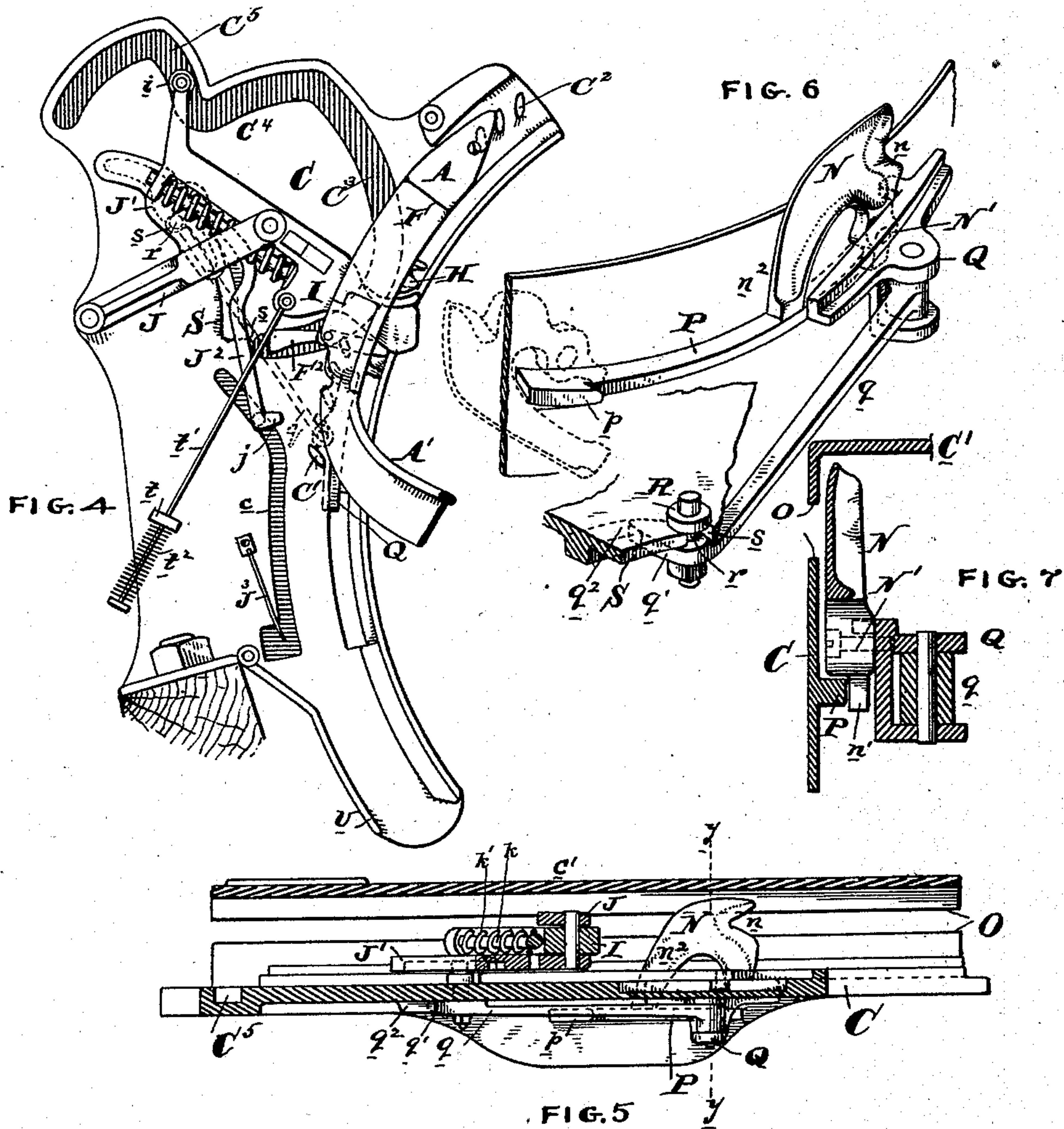
5 Sheets—Sheet 2.

A. M. JENKINS.

GRAIN BINDER.

No. 413,283.

Patented Oct. 22, 1889.



WITNESSES:

Henry Drury
David L. Williams

INVENTOR:

Arthur M. Jenkins
By his atty
[Signature]

(No Model.)

5 Sheets—Sheet 3.

A. M. JENKINS.

GRAIN BINDER.

No. 413,283.

Patented Oct. 22, 1889.

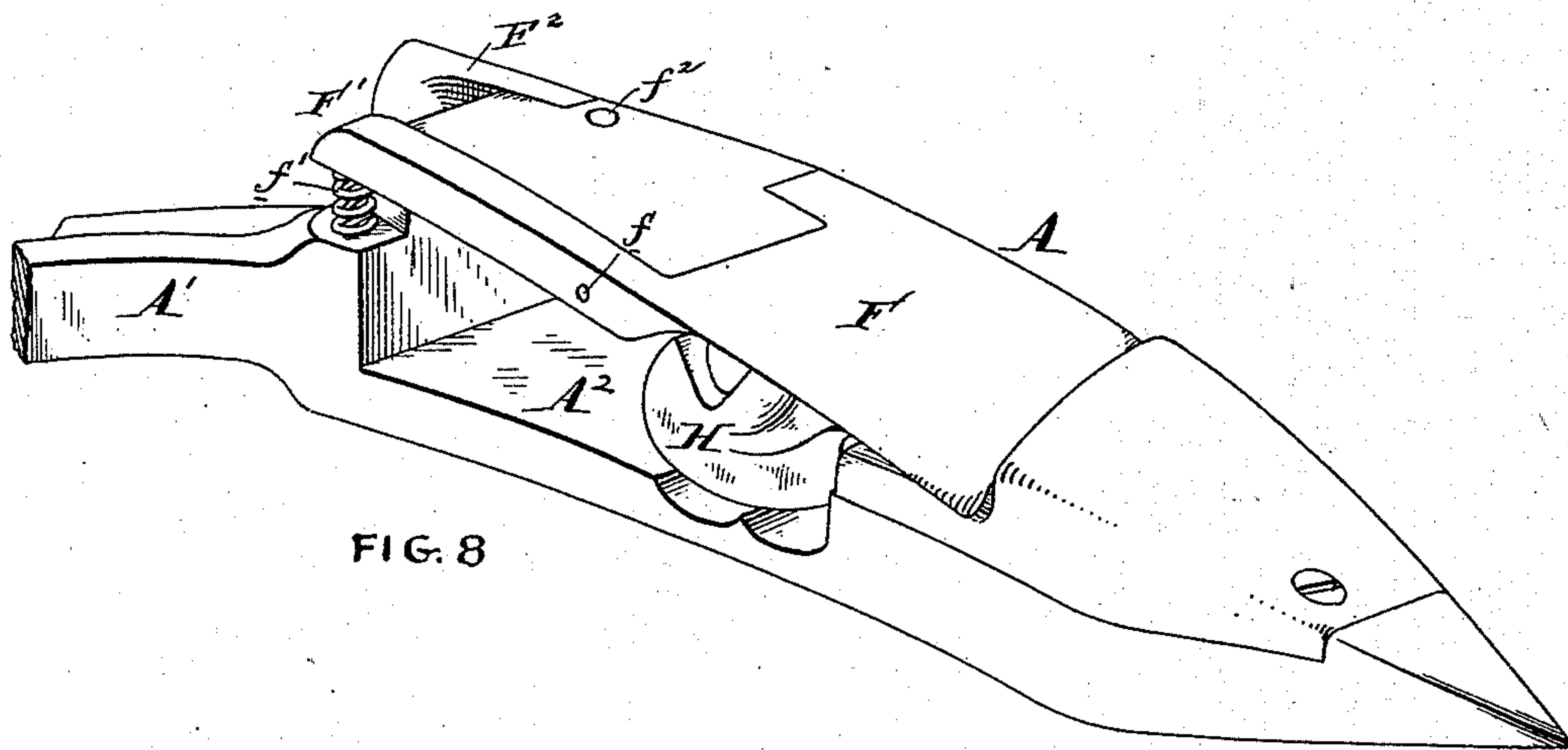


FIG. 8

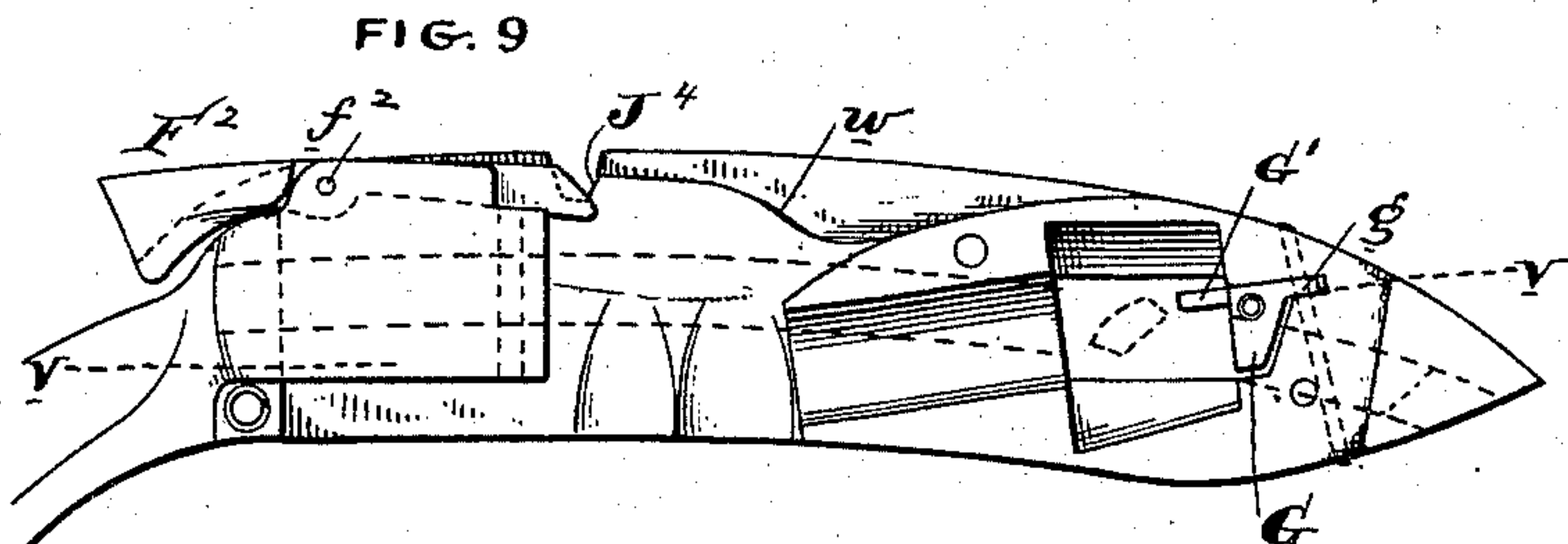


FIG. 9

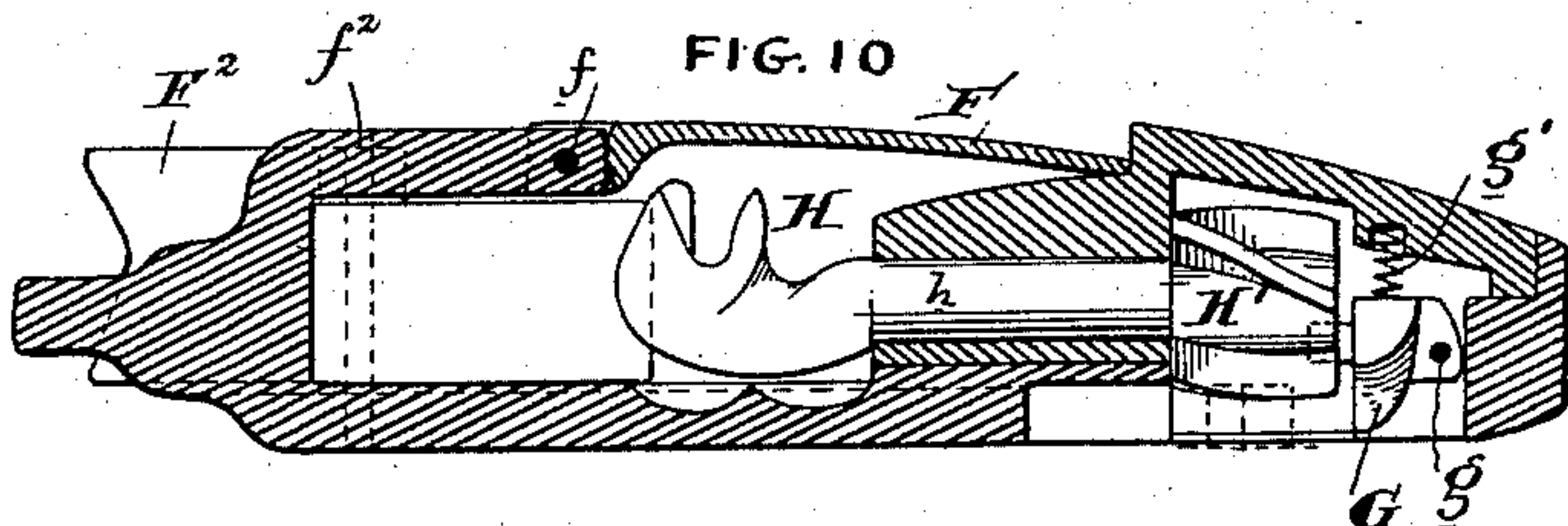


FIG. 10

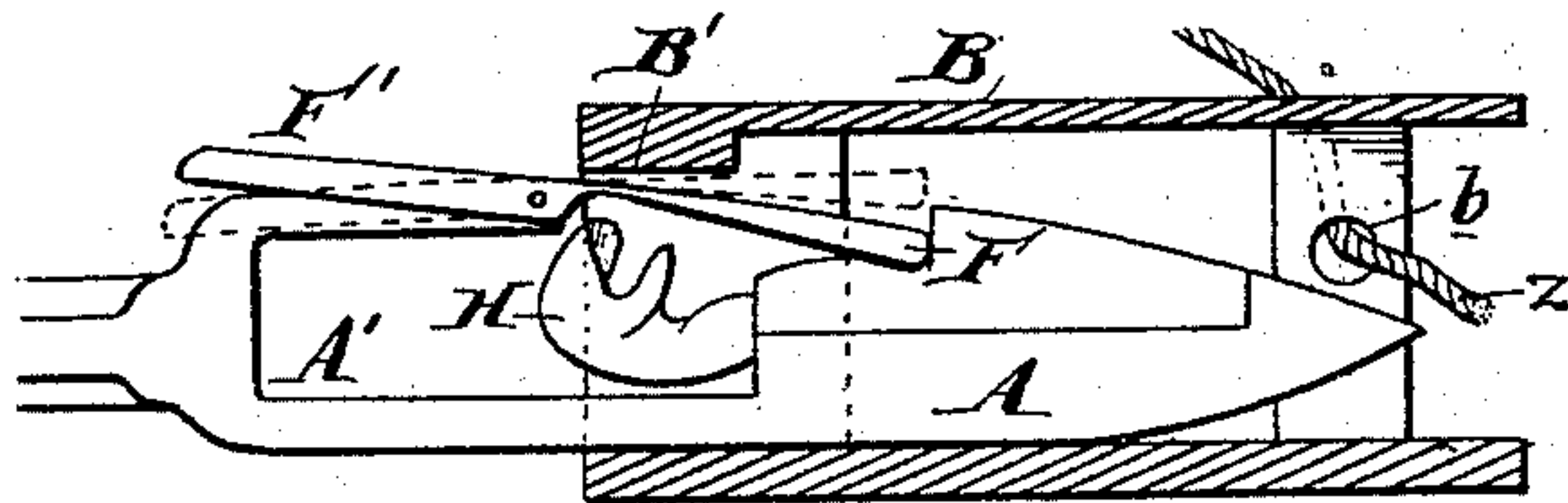


FIG. 14

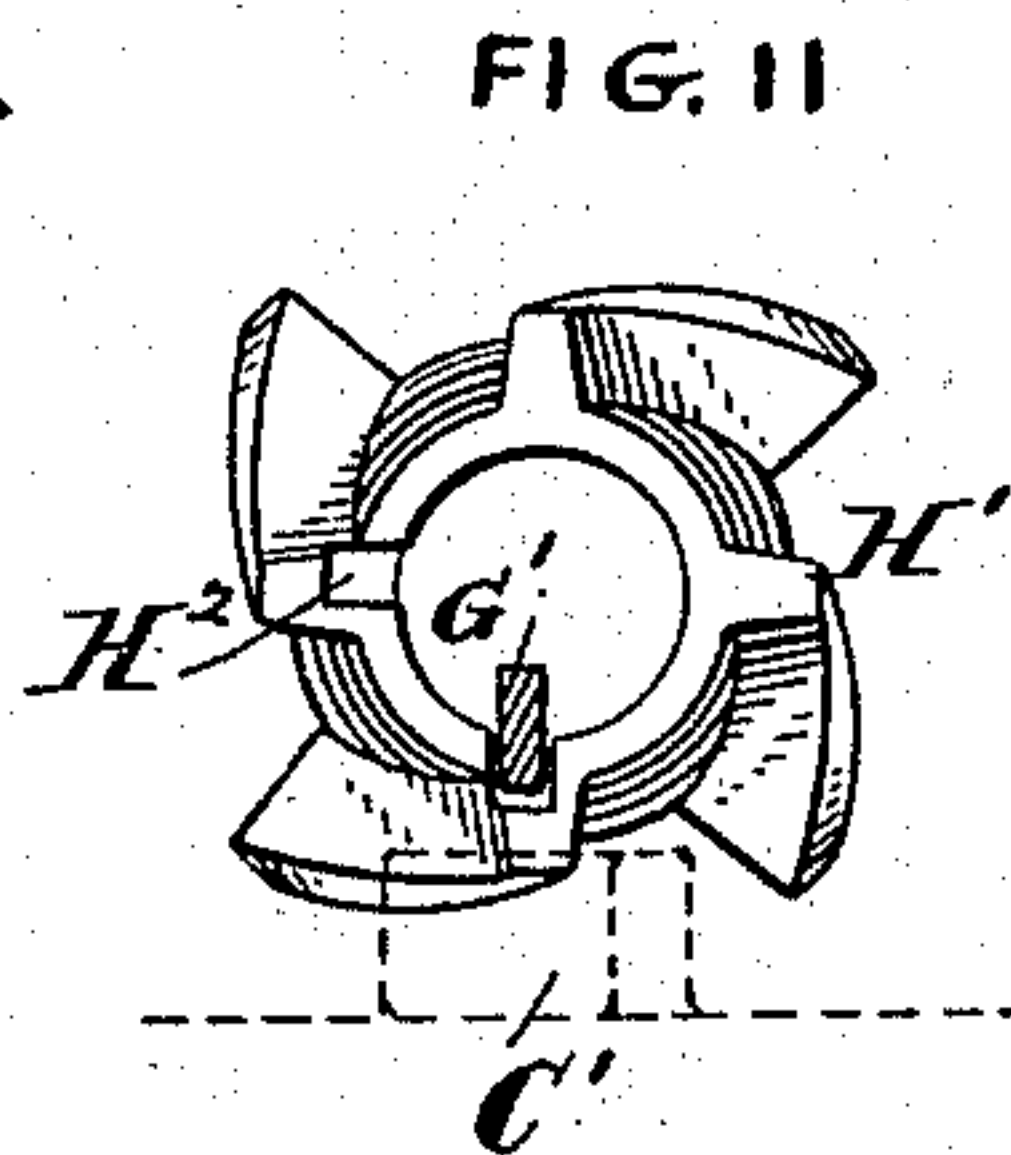


FIG. 11

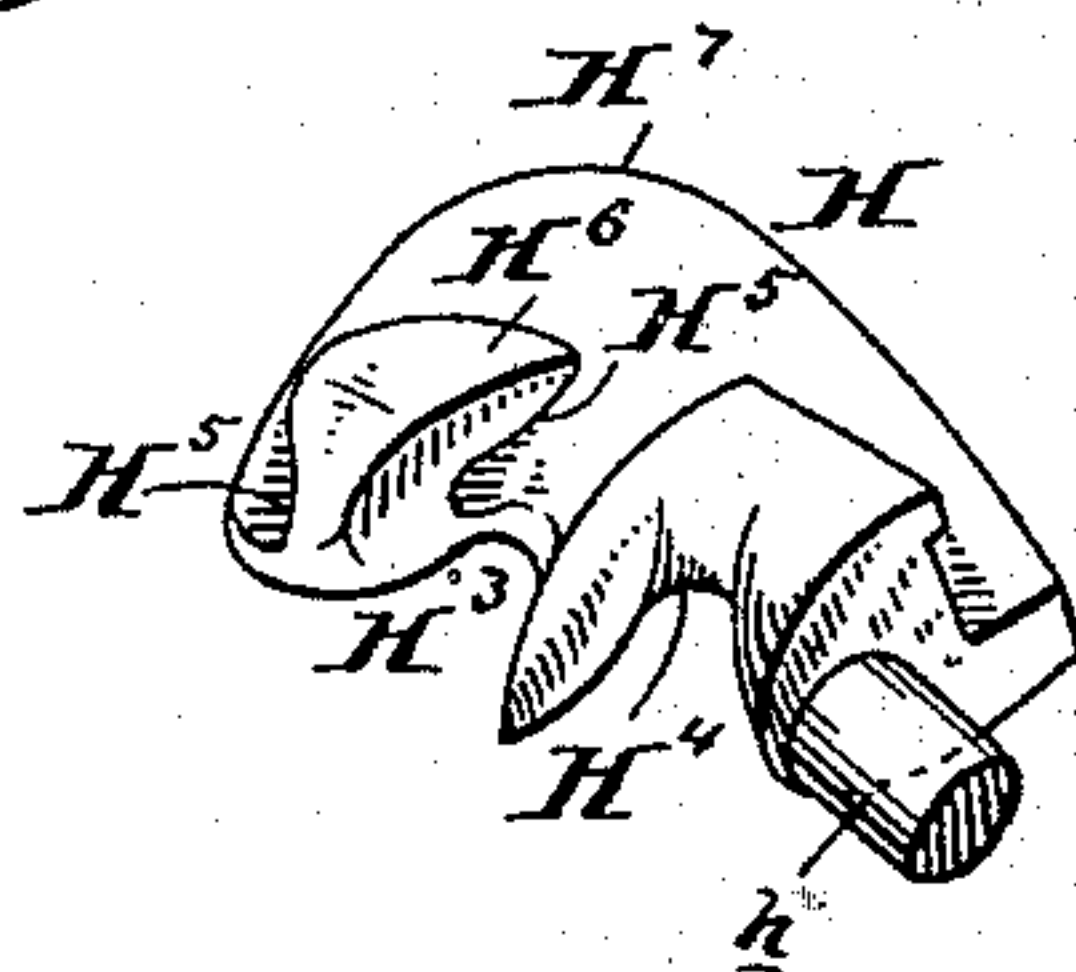


FIG. 12

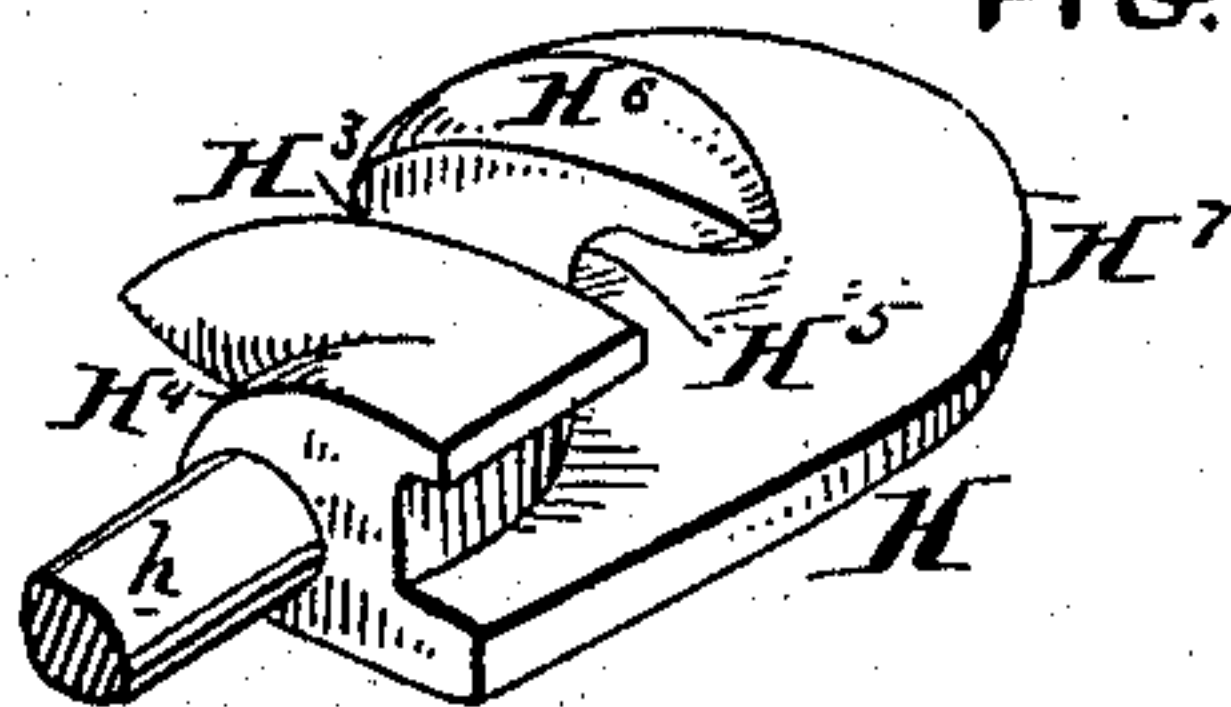


FIG. 13

WITNESSES:

Henry Dwyer
David S. Williams

INVENTOR:

Arthur M. Jenkins
By his atty
Wm. H. Smith

(No Model.)

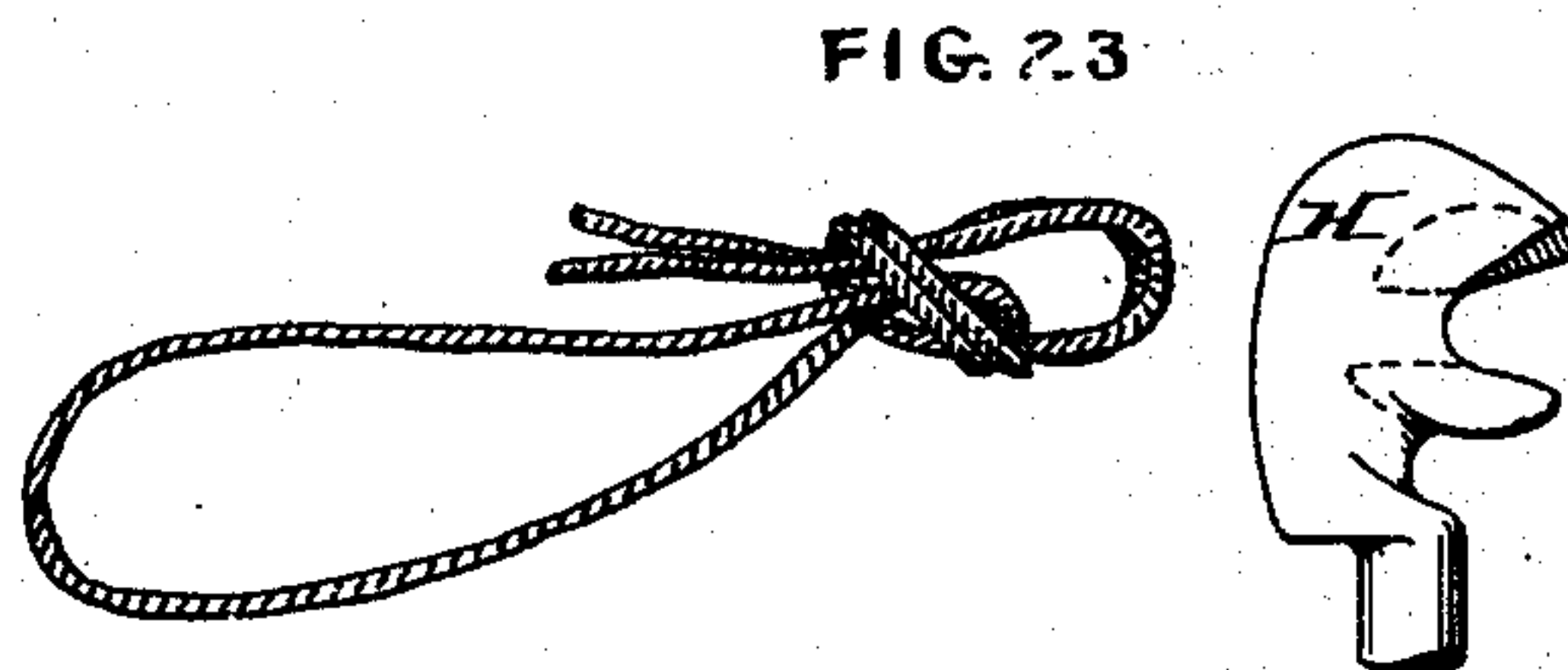
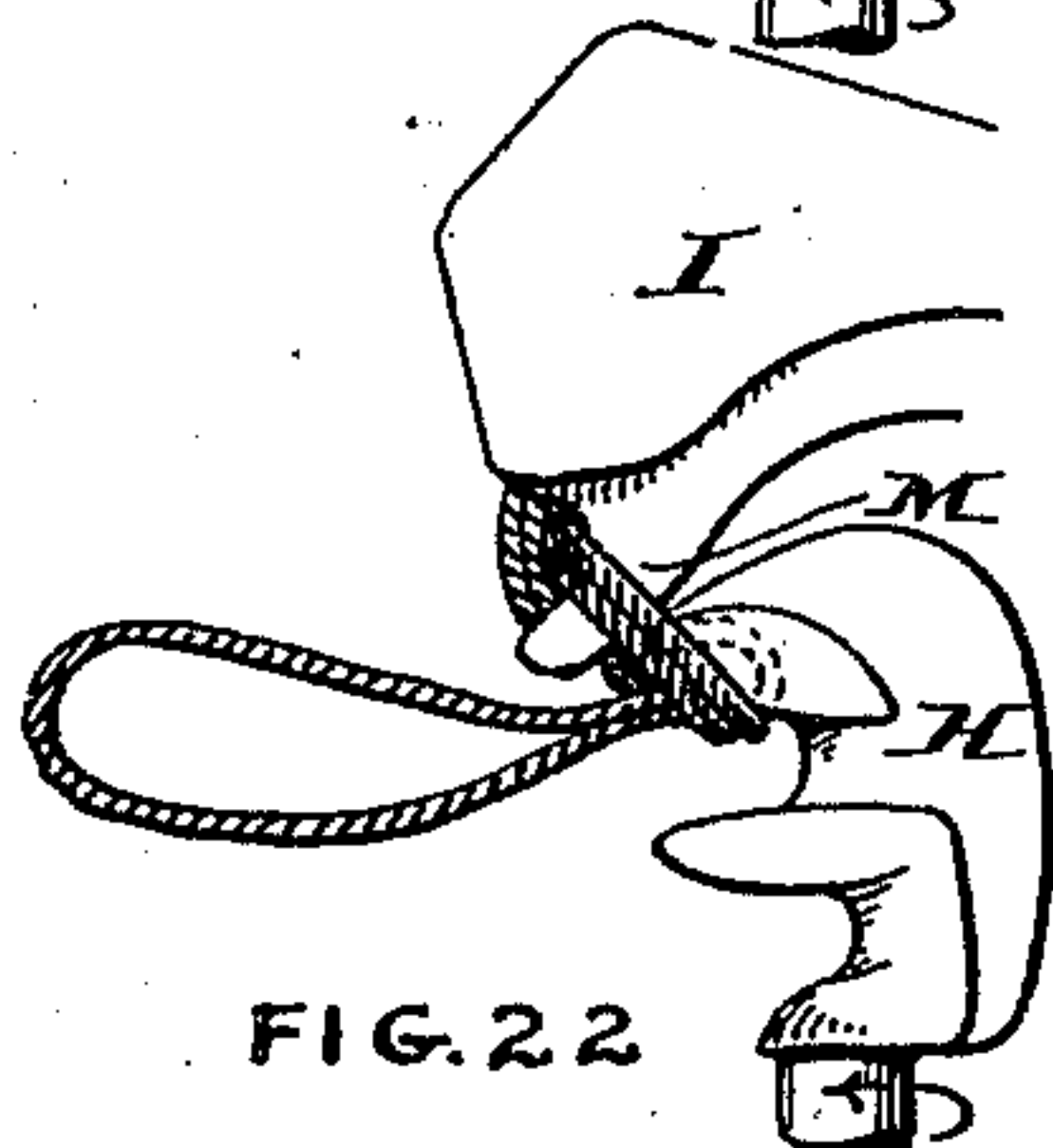
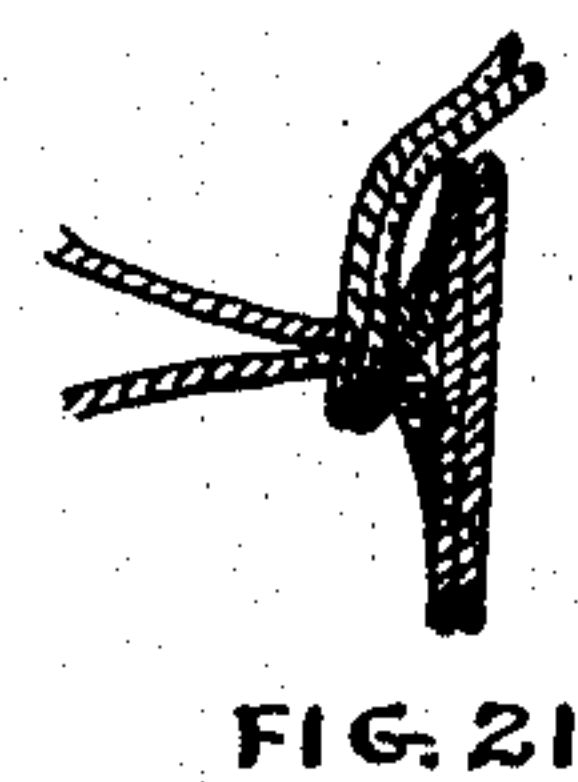
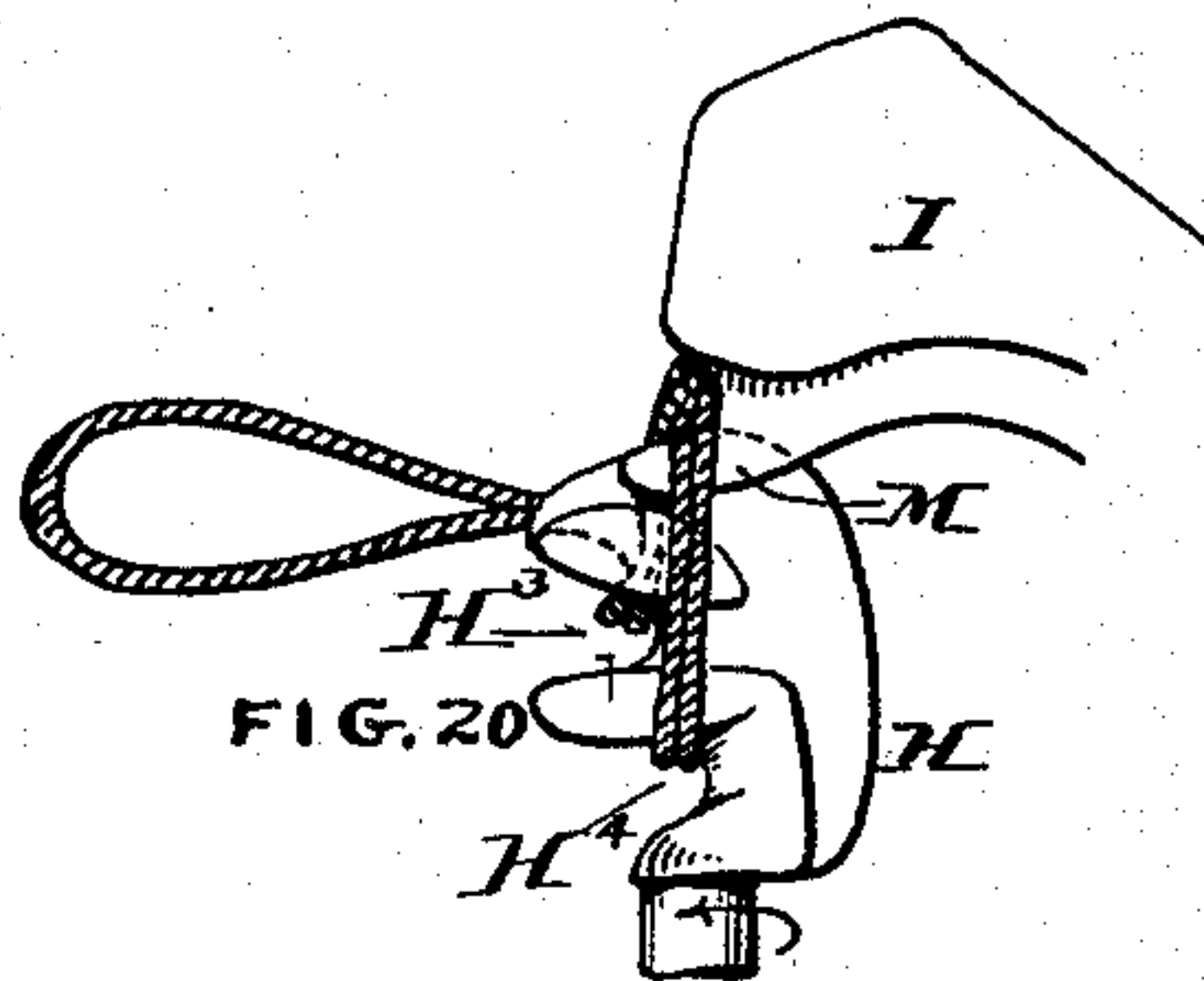
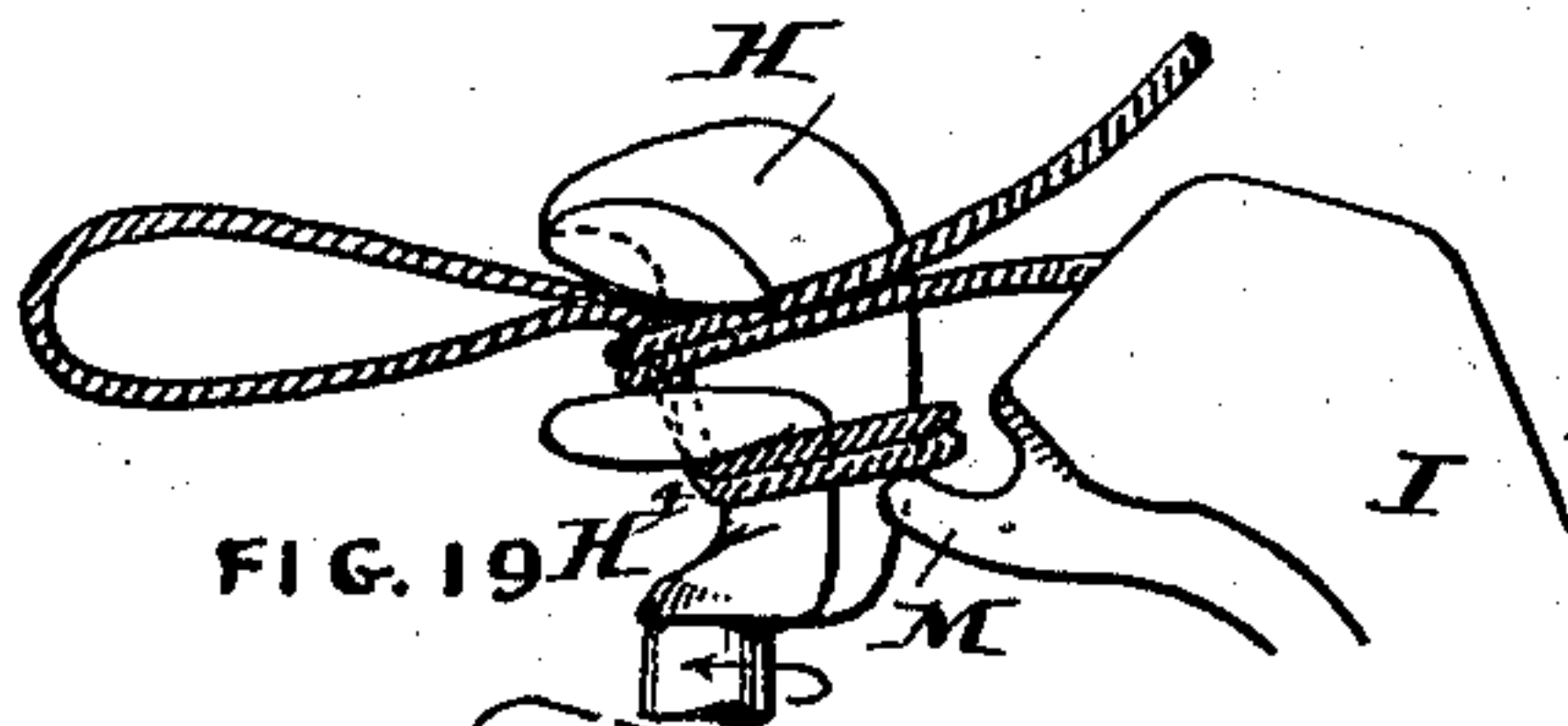
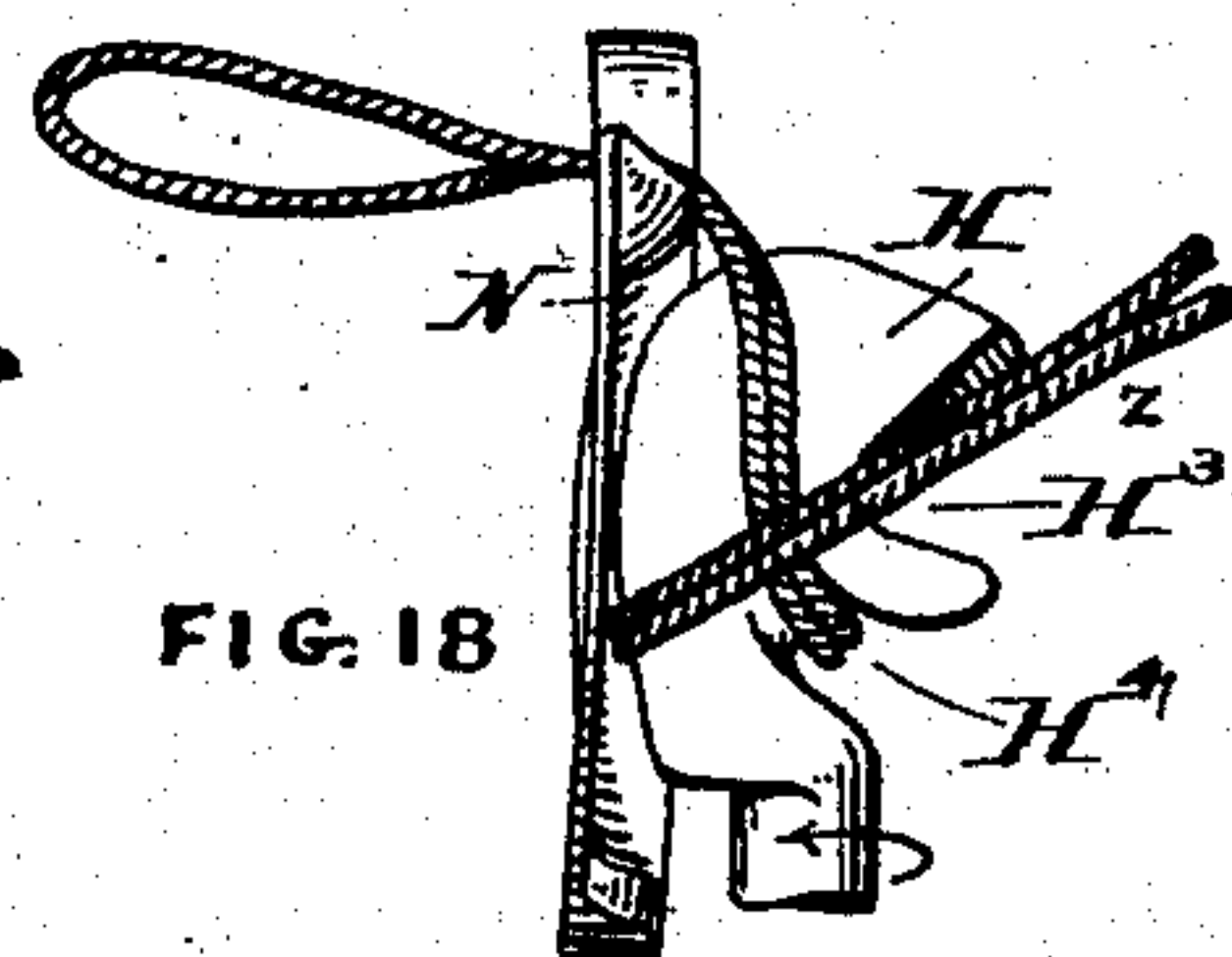
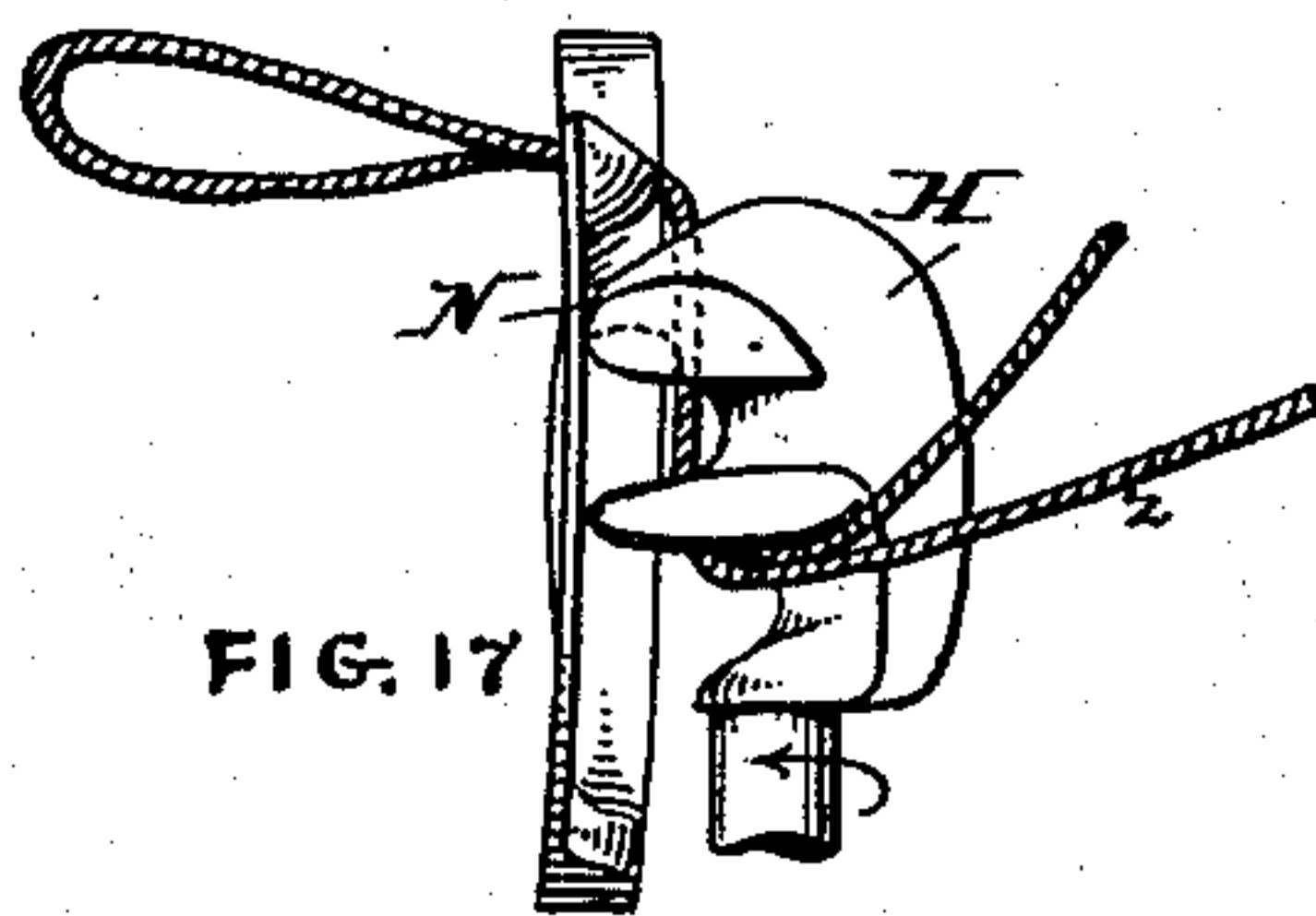
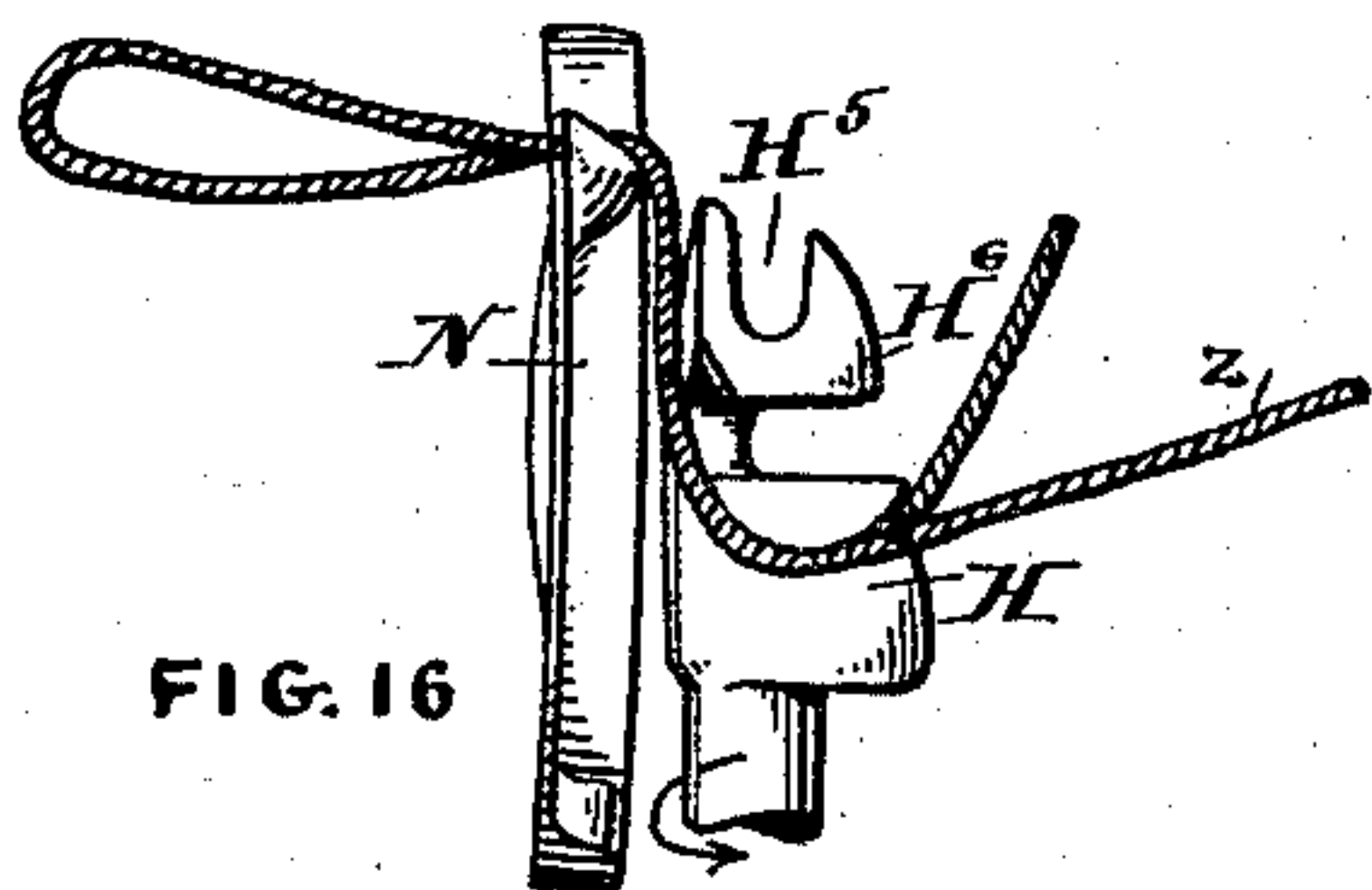
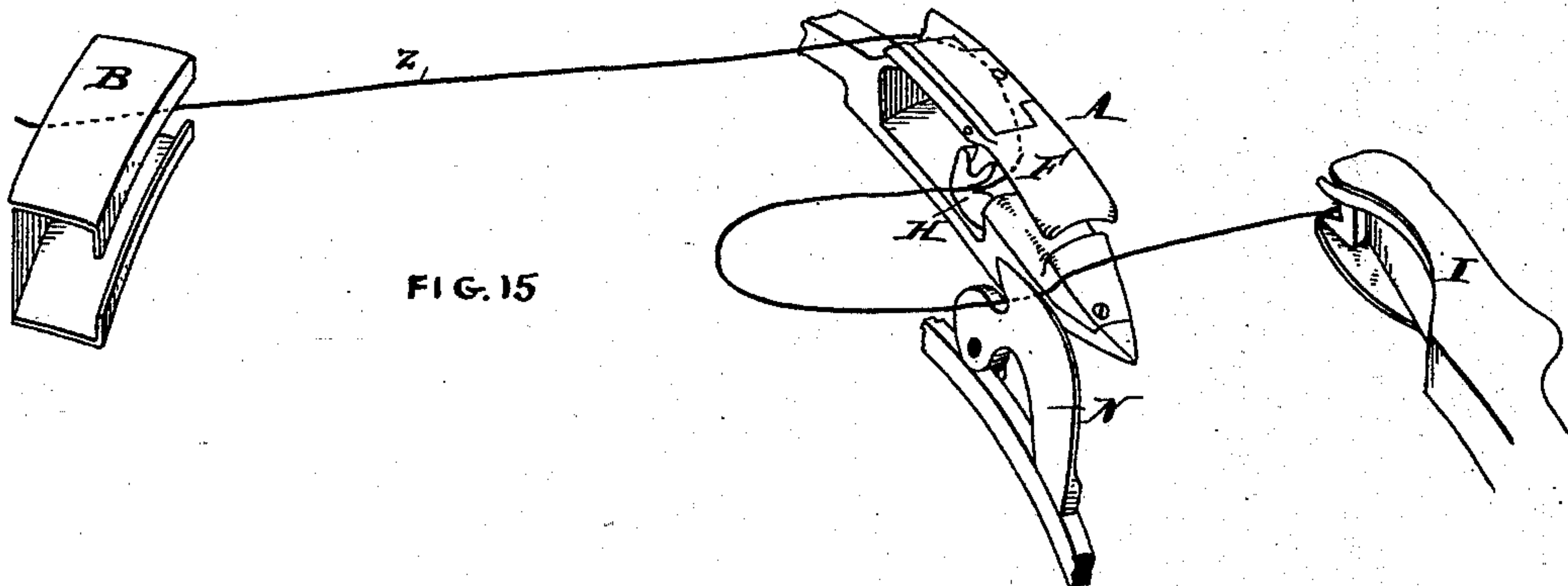
5 Sheets—Sheet 4.

A. M. JENKINS.

GRAIN BINDER.

No. 413,283.

Patented Oct. 22, 1889.



WITNESSES:

Henry Drury
David S. Williams,

INVENTOR:

Arthur M. Jenkins
By *Wm. A. [Signature]*

(No Model.)

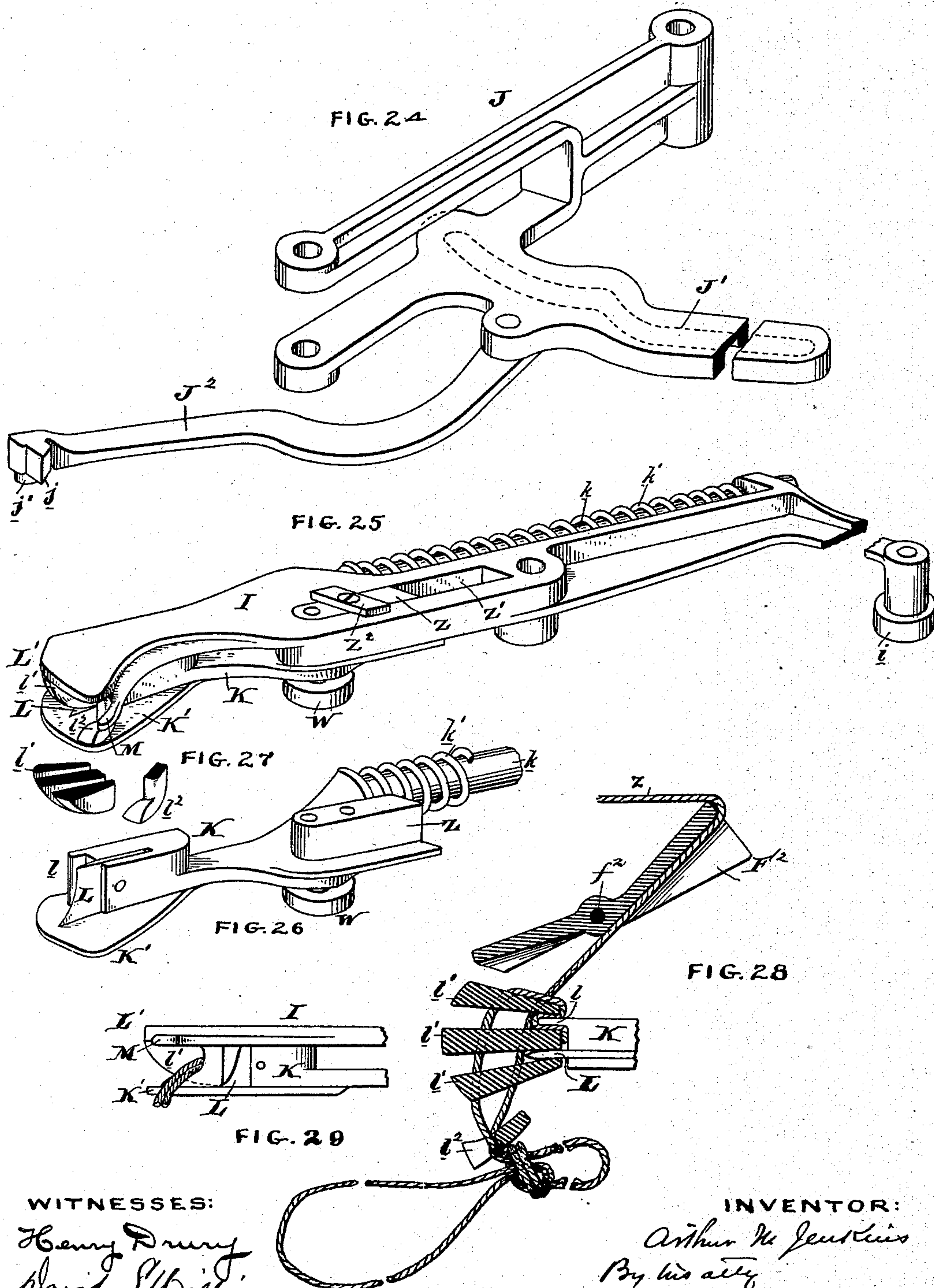
5 Sheets—Sheet 5.

A. M. JENKINS.

GRAIN BINDER.

No. 413,283.

Patented Oct. 22, 1889.



WITNESSES:

Henry Drury
David Williams

INVENTOR:

Arthur M. Jenkins
By his atty
R. M. Brown

UNITED STATES PATENT OFFICE.

ARTHUR M. JENKINS, OF NORRISTOWN, PENNSYLVANIA.

GRAIN-BINDER.

SPECIFICATION forming part of Letters Patent No. 413,283, dated October 22, 1889.

Application filed December 28, 1888. Serial No. 294,831. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR M. JENKINS, of Norristown, county of Montgomery, and State of Pennsylvania, have invented an Improvement in Grain-Binders, of which the following is a specification.

My invention has reference to grain-binders; and it consists of certain improvements, all of which are fully set forth in the following specification and shown in the accompanying drawings, which form a part thereof.

In carrying out my invention I provide the needle-head with the looper and cause it in its rotation about an axis to pick up the cord, pass it around the bundle, and deliver such cord at a point between the looper and spool to the cord-holder, whereby when the bound bundle is discharged with its binding-cord the then free end of the cord is held in the cord-holder ready for the next bundle. The needle-head passes through suitable segmental or other guides provided with the means necessary for operating the looper.

In my invention the cord-holder is made movable, and is carried with the progressive movement of the needle-head, and its travel is commensurate with the movement of the needle-head. The cord-holder moves up close to the looper in the needle-head, and is provided with a hook, which travels through a groove on said looper for the purpose of freeing the loop from the looper and pushing the knot close up to the bundle. Working in conjunction with the needle-head and cord-holder is a cord-gatherer, the function of which is to bring the cords forming the terminals of the loop around the bundle together and in position to be properly acted on by the looper, the said cord-gathering device being automatically moved out of the way by the cords in the custody of the needle-head after the looper has made its revolution, so as to make room for the approach of the cord-holder and its cord-cutter toward the looper.

This binder may be used on various makes of machines; but for simplicity I have shown it on a gleaner and binder. It may be provided with a suitable grain or bundle compressing device to assist in compressing the bundle and relieve the binding-cord from excessive tension until after the knot has been

tied and the bundle is bound or ready for delivery.

The mere details of my invention may be modified or varied in many ways to suit the ideas of mechanics without departing from the spirit of the invention; hence I do not limit myself to the precise structures shown.

A better understanding of my invention will be had from the accompanying drawings, in which—

Figure 1 is a sectional side elevation of a harvesting-machine embodying my invention. Fig. 2 is a side elevation of the needle-arm, head, cord-holder, and operating devices exposed to view prior to tying the knot. Fig. 3 is an inverted view of the covering-plate removed from Fig. 2. Fig. 4 is a similar view to that of Fig. 2, showing position of parts after the knot has just been tied and before the cord is liberated from the looper. Fig. 5 is a cross-section of Fig. 2 on line *xx*. Fig. 6 is a perspective view of the cord-gatherer and its connection. Fig. 7 is a cross-section of Fig. 5 on line *yy*. Fig. 8 is a perspective view of the needle-head. Fig. 9 is a side view of the needle-head with the outer portions and looper removed. Fig. 10 is a sectional elevation of the needle-head on line *vv* of Fig. 9. Fig. 11 is an end view of the looper-pinion, showing locking-pawl. Figs. 12 and 13 are perspective views of the looper. Fig. 14 is an elevation of the needle-head passing through the segmental guide (in section) just prior to picking up the cord. Fig. 15 is a skeleton perspective view showing relative cord-connections between the cord-supply, needle-head, cord-gatherer, and cord-holder in act of binding a bundle. Figs. 16 to 23 are general views, showing process of forming the knot, and are especially designed to illustrate the operation of the looper and the kind of knot tied. Figs. 24 to 27 are perspective views of the cord-holder and cord-cutter mechanism removed and disconnected; Fig. 28, a detail view, part in section, showing how the cord holder and cutter act on the cord; and Fig. 29 is a side elevation of the end of the cord-holder, cutter, and stripper.

The gleaner shown in Fig. 1 is a well-known type of machine, and I will not describe it more than to say that the grain is

picked up by the toothed wheels D and *d* and elevated between the guides D' and *d'* until it reaches the binding devices above. As the grain is pushed up it is packed against the compressor-band *e*, connected at its upper end to the pivoted arm E and at its lower end to a lever E', hinged to the main frame of the machine and provided with a spring *e'*, to resist its upward movement. As the needle-arm A' swings down, around, and up, the grain is pressed together between the compressor-band *e* and the said needle-arm A', and simultaneously the binding-cord is passed around the bundle and tied, as will be fully described. When the bundle is bound and the needle-arm passes upward and over in the act of discharging the bundle, the compressor arm E is lifted, and is free to swing up as the bundle is pushed against it by the needle-arm, opening a channel for the passage of the bound bundle. The needle-arm is secured to a rotating shaft *a*, which may be operated in any suitable manner.

A is the needle-head, and is of peculiar construction, and contains the rotating loop-er. The needle-head, in its travel about the shaft *a* as a center, passes in succession through the segments B and C, the former of which presents the cord to the looper in the head, and the latter of which contains the cord-holder, cord-cutter, cord-gatherer, and means for operating the devices contained in the needle-head and employed in the production of the knot on the cord. These segments B and C are secured to the frame of the machine, and preferably provide a passage-way for the grain and bound bundle from two points. For instance, in the construction shown in Fig. 1 the grain is received at the bottom between parts B and C, and the bound bundle is discharged at the top between parts B and C; but it is evident that after the knot is fully tied it is immaterial how the needle-arm may be manipulated to discharge the bound bundle.

The segment B is simply a slotted guide, through which the needle-head passes. It has a cord-guide *b* to properly present the cord to the needle-head. It has also a cam projection B', the function of which is to oscillate the jaw of the needle-head so as to raise it above the cord Z, passing through guide *b*, and cause the cord to pass into the looper in the head. This segment is shown in Figs. 1, 14, and 15. The segment C is much longer than segment B. It is slotted at O for the needle-arm. It is shown in Figs. 1, 2, 3, 4, 5, 6, and 7. I will refer to it after describing the needle-head.

The needle-head A, which is particularly shown in Figs. 8 to 14, is made pointed to readily pass through the grain, and is recessed or made hollow, as at A', for the looper H. The looper H has a shaft *h*, journaled longitudinally in the head and provided with the worm-pinion H', Figs. 10 and 11. One side face of the needle-head is cut open to allow the cord to

pass in to the looper; but this opening is covered with a jaw F, pivoted at *f* to the head, and having a tail or rear extension F', by which it may be oscillated. The looper-pinion has two notches H², arranged at angles to each other and adapted to receive the pawl G' of the block G, pivoted to the head at *g* and pressed into connection by a spring *g'*. By this means the looper may be locked in either of two positions when not being rotated. The same teeth which rotate the pinion of the looper cause the pawl to be moved to free the pinion. To the outer periphery of the head is a pivoted arm F², hinged at *f*² to the head, and adapted to guide the cord between the looper and cord-guide *b* and insure its proper presentation to the tying devices. This is shown in Figs. 9, 10, and 28. The looper H is of novel construction, and is clearly shown in the various Figs. 8 to 18 and 15 to 21 and 22. It is formed of an integral piece with the notches H³ and H⁴ on one edge backed by a curved flattened part H⁷, and formed with the curved groove H⁵, leaving the overhanging projection H⁶ pointing away from the notch H³. The utility of this construction will be shown later on.

Referring now to Sheets 1, 2, and 5, we will see the devices contained in the segment C and operated by the needle-head and for operating the movable part of the needle-head. The passage-way for the head has two sets of teeth C' and C², the former of which cause the pinion H' and the looper H to rotate to form the loop, and the latter cause the rotation of the same parts to bring the looper into position to cast off the loop after the bundle is bound. These teeth are separated at an interval in which the looper is not rotated and during which it is locked in position, while the stripper M of the cord-holder forces the loop over the looper. (See Figs. 19, 20, and 22.) These teeth C' C² are upon one face of the segment C, while upon the other face is simply a recess *c*⁴ and cam-surface *c'*, which latter acts on the rear extension F' of the jaw F of the needle-head to open said jaw in receiving the cord end originally held in the cord-holder. The recess *c*⁴ allows the jaws F to close after the cord has been received, and it is thus seen that the whole of the surface in the segment adjacent to the travel of the needle-head, except the recess portion *c*⁴, is a cam. The back surface U at the lower part of the segment acts as a cam to operate pivoted arm F² to insure the cord leading from the spool being properly presented to the looper.

N is the cord-gatherer or device for insuring the cord ends from the bundle being presented to the looper close together. As shown in Sheet 2, it consists of a pivoted sliding piece N, having the notch *n* for gathering the cords, and hinged at N' to a carriage Q, traveling upon the segment. The forward end of the piece N is provided with a foot *n*², which runs upon a guide P, having a projection *p* at its

end. The lower end of the piece N below its pivot-joint is extended, as at n' . Now, as the carriage Q moves, the gatherer moves with it, and when end n^2 passes over the end of the guide P the cords may pull the piece N over to the position shown in dotted lines, Fig. 6, and release the cords. To positively insure this tilting action, the extension n' will strike the lug p of the guide, and the further movement of the carriage insures the rocking of the piece N to liberate the cords. The carriage Q has an arm q , having on its free end a stop q' , a pin r , and roller R. The stop q' catches on a lug q^2 on the segment, Fig. 6, the pin r works in a reverse curved slot S, having the curved part concentric with the pivot-point of the cord-holder hinge-arm J, Fig. 2 or 4, and provided with abrupt parts s at each end, and the roller R works in the cam-groove J' in hinge-arm J of the cord-holder. When this arm J is moved up, its cam causes the pin r to move out of s into slot S, and then the cord-gatherer can move over its guide, and is so moved by a movement of the arm J and its cam J' . At the end of its stroke the cam J' again operates on roller R to force the pin r into the part s at the other end of the slot S until the cord-holder, with its cord, has returned to its original position and ready for the next bundle.

The cord-holder I is hinged to the hinge-arm J, as shown, and has at its upper end a roller or pin i , running in a cam-groove C^3 C^4 C^5 . Its lower end has the cord-holder devices and cord-cutter. As the arm J is moved up, the cord-holder is moved up also, and has a peculiar movement, such that its lower part is caused to approach the needle-head, then move in close juxtaposition with the looper, moving the stripper M through the groove H^5 of the looper, and finally withdrawing the cord-holder from the looper and needle-head. The arm J is moved by the needle-head through the link J^2 , Figs. 2, 4, and 24, one end of which is hinged to the arm J and the other end at j' is guided in a groove c in the segment C. A spring J^3 presses against the lower end of the link and forces its projection j into the path of the needle-head. The groove c is concentric with the axis of the needle-arm for part of its way, and then deviates so as to move the link away from the needle-head and liberate the arm J and the cord-holder. The needle-head has a notch J^4 , Fig. 9, which receives the projection j , the spring J^3 simply acting to hold the parts in contact until the end j' enters the groove c and to admit of the head A forcing its way past the projection j and until such projection is received in its notch.

The cord holder and cutter is shown in Fig. 25, and consists of a frame I, having the head L' , formed with teeth l' l^2 , separated by intervals, Figs. 27 and 28, and a movable frame K, carried on the frame I by guide-rod k and forced in one direction by a spring k' . The end of this frame K is formed with a finger

l and a cutter L, Figs. 26 and 28, which enter the spaces in the rear between the parts l' . The frame K has a guide-block Z, which fits and slides in a groove Z' in the frame I, and the two parts are held together with provision for movement by the keeper Z^2 . The frame K has a roller W, which is caused to come in contact with the camway w in the needle-head and move the cutter and finger back, compressing the spring k' , and allowing the cord to be pushed up into the holder and in position to be cut. The cord assumes the position in the holder and cutter shown in Fig. 28 just prior to the cord-holder fingers l' moving from the finger l and cutter L. As soon as these parts separate the short end of the cord is liberated and the long end of the cord Z passes up between the fingers l' and cutter, and upon their closing the cord is cut near the knot and the long end of the cord is held in the holder ready for the next bundle. The bound bundle is then liberated. This holder is also provided with the stripper M, which is made like a hook and sweeps over the looper to strip the loop off the looper simultaneously with the action of grasping the cord in the holder and cutting the cord, as indicated in Figs. 19, 20, and 22. It will now be understood that the cam part C^3 , Fig. 2, causes the cord-holder to approach the looper, the cam part C^4 to hold the part I while the needle-head pushes the part K back, and the part C^5 to withdraw the cord-holder from the needle-head.

Instead of relying upon gravity to return the cord-holder to its original position, it may be drawn back by a spring t^2 acting on a rod t' , working through a guide t on the segment C, which is adapted to hold the spring, as shown in Fig. 2.

The operation will now be understood. The cord-holder has one end of the cord Z, and the cord extends back of the cord-gatherer N, thence to the segment B, through the guide b , to the spool T, which may have a tension device T' of any suitable construction. The grain being fed up and packed, as before explained, the needle-arm descends, passing through the segment B, picking up the cord. The needle-arm is now passed through the grain, carrying the cord around the bundle, and then ascends to pass through the segment C. The relative arrangement of the cord with the cord-holder, cord-gatherer, a needle-head, and segment B will then be substantially as shown in Fig. 15. Now, as the needle-head ascends the segment C, the cam-face c' opens the jaw F and holds it open, and the cam-face U holds the arm F^2 in such position that the two cord ends of the bundle-loop are caused to extend across the notch H^4 of the looper H. As the needle-head reaches this position the link J^2 engages with it, and in its further upward movement it reaches the position shown in Fig. 2, in which it will be seen that the cam J' has just liberated the pin r from s , and thus freed the gatherer.

The cords in the looper will then be as in Fig. 16. As the needle-head continues to move up, the gatherer moves with it until it falls out of the way, Fig. 6, and in such position it is locked by the pin *r* entering the other slot *s* of *S*, and secured there by cam *J*, awaiting the return of the cord-holder. The looper *H*, just prior to the removal of the cord-gatherer, is caused to make one and one-quarter revolution by the teeth *C'*, and the cord will be shown as in Figs. 17, 18, and 19. About the ending of this rotation of the looper the cord-gatherer is removed. At this time the cord-holder is about to take the second end of the cord, and the stripper *M* is about to strip the loop from the looper. A further movement of the needle-head causes the cord-holder to take the other cord end and the stripper *M* to push the loop over the looper, as shown in Fig. 20. About this time the cam-surface *w* of the needle-head presses on the roller *W* of the cord holder and cutter, (the roller *i* being in cam-groove *C'*), and the cord is in condition for being severed. A further movement insures the complete pushing over of the loop, Fig. 22, by the stripper, and then the roller *i* passes into cam-groove *C⁵*, relieving the spring *k'*, and the cutter *L* is forced forward and severs the cord. A further movement of the needle-head causes the looper to make three-quarters of a revolution to free the knot from the hook *H⁶* of the looper, as shown in Fig. 23. The further movement of the needle-arm carries the bound bundle up and over, discharging it, while the cord-holder returns to its normal position. It will be observed that in the upward rise of the cord-holder the end thereof and stripper entered the needle-head, Fig. 4, and then the link *J²* was drawn out of contact with the head by the curved upper part of the cam *c*. The subsequent movements of the cord-holder are due to indirect connection with the needle-head and cord on the looper. The cord-holder and looper-stripper are held to the looper by the cords forming the knot, for if it were not for these cords the spring *t²* would cause the said holder and stripper to tend to leave the looper. The cords pull the holder and stripper over the looper and supply the necessary cord and by said cords are positively moved and temporarily connected. I would also remark that in this device the stripper pushes the loop of the knot close up to the bundle and does not allow of the bundle being bound loosely. The cord is caused to enter the different notches in the looper in accordance with the presentation—that is to say, when the looper first takes the cords in the notch *H⁴*, Fig. 16, there is no rotation; but in the subsequent wrappings of the cord the rotations and position of the cord-holder are the fundamental agencies which govern or control the arrangement of the cords in the grooves. For instance, during the rotations of Figs. 17 and 18 the cord-holder is rela-

tively shifted to make a further rotation of the looper to take the cord ends in the second groove *H³*, Fig. 19. Subsequently another shifting of the cord-holder and stripper causes the cord ends to lie in the groove *H⁵* and strip the original loop over the point or hook *H⁶*, Figs. 12, 13, and 20. When the cord-holder *I* is at the lowest position or approaching that shown in Fig. 2, the cord pulls direct from the cord-holder over to the segment *B*. (See Fig. 1.) As the needle-head swings around to the position shown in Fig. 2, it has put considerable tension on the cord, and this pulls upon the holder *I* at its lower part. This action is resisted by the hinged arm *J* and the roller *i* in the cam-groove *C³*. Thus the cord cannot influence the position of the cord-holder in the start, and the rigidity of the cord-holder insures the cord being received in the needle-head properly.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A looper consisting of a rotating head having two integral or rigid jaws, forming between them a notch, and in which the outer jaw has upon its outer surface and to one side a rearwardly-extending hook.

2. A looper consisting of a rotating head having two integral or rigid jaws, forming a notch between them, and in which the outer jaw has upon its outer surface and to one side a rearwardly-extending hook and a groove extending from the back of the hook toward the outer end and point of the jaw.

3. A looper consisting of a rotating head having two integral or rigid jaws, forming a notch between them, and in which the outer jaw has upon its outer surface and to one side a rearwardly-extending hook and a groove extending from the back of the hook toward the outer end and point of the jaw, in combination with a cord-holder and cord-cutter working over the end of said looper.

4. A looper consisting of a rotating head having two parallel notches *H³* *H⁴*, parallel to the plane of rotation and opening in the same direction, one longitudinal groove *H⁵* at substantially right angles to the plane of rotation, in combination with a cord-holder, cord-cutter, and stripper working over the end of said looper, means to rotate the looper, a lock to lock the looper against rotation, and a needle-head carrying the looper, the movement of the needle-head and looper causing the cord-holder, cord-cutter, and stripper to pass over the end of the looper when locked.

5. A needle-head of a grain-binder, provided with a knot-tyer contained within and carried by it, and consisting of two rigid jaws, forming a notch between them, and in which the outer jaw has upon its outer surface, exterior to the notch and to one side, a rearwardly-extending hook.

6. A looper for a knot-tyer, consisting of two jaws rigidly connected to form a notch, the inner jaw being formed wide and the

outer jaw formed narrow, but with a laterally-arranged and rearwardly-extending hook exterior to the notch and overhanging the surface of the inner jaw.

5 7. A looper-head for a cord-knotter, consisting of two integral or rigid jaws having an unobstructed notch or opening between them and located wholly to one side of the axis of rotation of the looper-head, and in which one
10 of the jaws is provided on its outer surface and side, which is in the rear in rotating the looper-head upon making a loop, with a rearwardly-extending hook.

15 8. The combination of a movable needle-head carrying a cord-looper, a movable cord-holder, a separable connection between the needle-head and cord-holder for moving the cord-holder with the needle-head during a portion of its travel, a link pivoted to the
20 cord-holder at its middle to allow it to oscillate, and cam devices acting upon the rear end of the cord-holder to move the cord-holder to or from the looper of the needle-head during such associated travel.

25 9. The combination of a movable needle-head carrying a cord-looper and having a notch J^4 , a movable cord-holder, a separable connecting-arm J^2 between the needle-head and cord-holder for moving the cord-holder
30 with the needle-head during a portion of its travel, and a cam c , acting on the arm J^2 to move it away from the needle-head to break said connection between the needle-head and cord-holder at a given point in the travel of
35 said needle-head.

40 10. The combination of a movable needle-head carrying a cord-looper of a knot-tyer with a movable cord-holder, a hinge-arm carrying the cord-holder at its free end on a hinge-joint, a separable connection between the hinge-arm and needle-head, whereby the former operates the latter, and cams to control the oscillation of the cord-holder upon the hinge-arm during its travel with the
45 needle-head.

50 11. The combination of the cord-guide segment B , having cam-surface B' , with cord-holder segment C , having cam-surface c' and depression c , a rotating needle-head moving through said segments and having a cord-looper of a knot-tyer, and a pivoted jaw F , having the rear extension F' , for coming in contact with the said cam-surfaces to open the jaw and guide the cord to the looper.

55 12. The combination of a rotating needle-arm, a stationary segment or frame through which the needle-head passes, a cord-gatherer movable in the path of the needle-arm, a link for holding said cord-gatherer during its
60 travel, a separable link-connection between

the needle-arm and the cord-gatherer, whereby the movement of the needle-arm causes the cord-gatherer to move with it for a given distance of its travel, and a cam to control said link-connection to liberate the cord-gatherer from the needle-arm. 65

13. The combination of a movable needle arm and head, a movable carriage moved thereby, a pivoted cord-gatherer pivoted to said carriage, and a guide to hold said cord-gatherer in a position to hold the cords until it reaches the end of its movement and then allow it to tilt to liberate the cords. 70

14. The combination of a movable needle arm and head, a movable carriage moved thereby, a pivoted cord-gatherer pivoted to said carriage, a guide to hold said cord-gatherer in a position to hold the cords until it reaches the end of its movement, then allow it to tilt to liberate the cords, a movable cord-holder, also actuated by the needle-arm, and a lock actuated by the cord-holder-actuating devices to lock the gatherer in its tilted position until after the reverse movement of the cord-holder. 75 80 85

15. A rotary looper formed of a solid piece of metal having a notch opening to one side, and a hook located on the looper beyond the notch and extending to one side of the looper and away from the notch, leaving it unobstructed, in combination with a stripper working over said looper, passing toward and to the rear of the hook. 90

16. A rotary looper formed of a solid piece of metal having a notch opening to one side, and a hook located on the looper beyond the notch and extending to one side of the looper and away from the notch, leaving it unobstructed, in combination with a cutter and holder working over said head of the looper. 95 100

17. The combination of a movable needle-head carrying a looper, a movable cord-holder movable with said needle-head, and also movable to and from it, and in which the cord-holder passes through the needle-head and past the looper during a portion of their travel. 105

18. A looper consisting of a rotating head having a notch H^3 in the plane of rotation, a backwardly-extending hook H^6 , and a transverse groove H^5 , transverse to the plane of rotation in the head and back of the notch H^3 and hook H^6 , substantially as and for the purpose specified. 110

In testimony of which invention I hereunto set my hand. 115

ARTHUR M. JENKINS.

Witnesses:

THEO. W. BEAN,

EUGENE D. EGBERT.