2 Sheets—Sheet 1.

S. D. CARPENTER.

Grain Binder.

No. 85,209. Patented Dec. 22, 1868.

Fig. 1

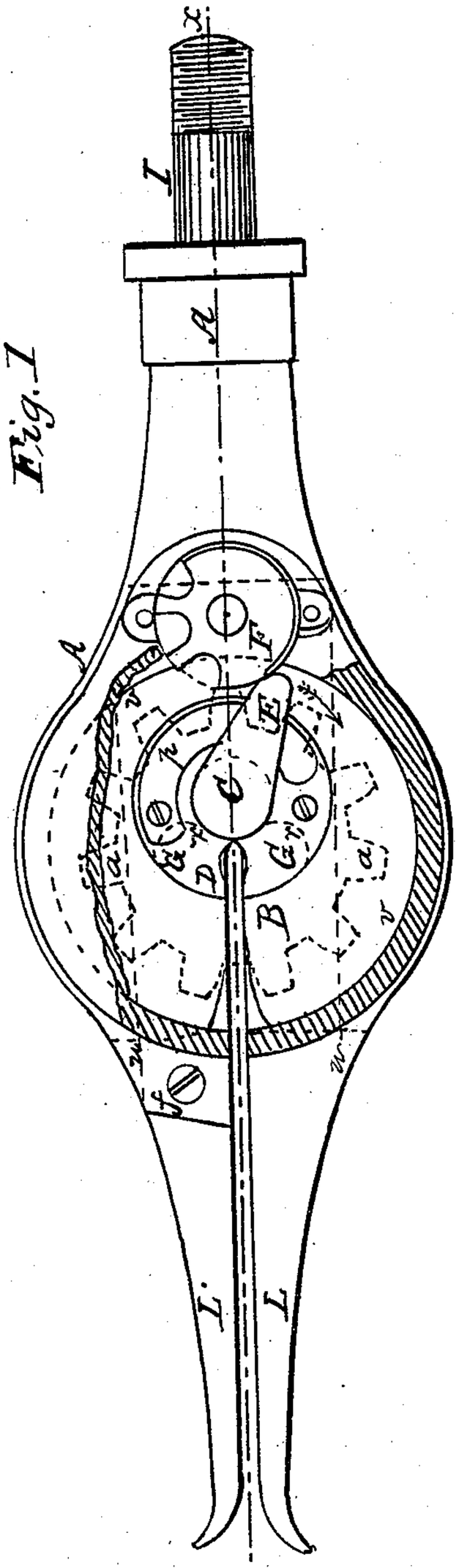
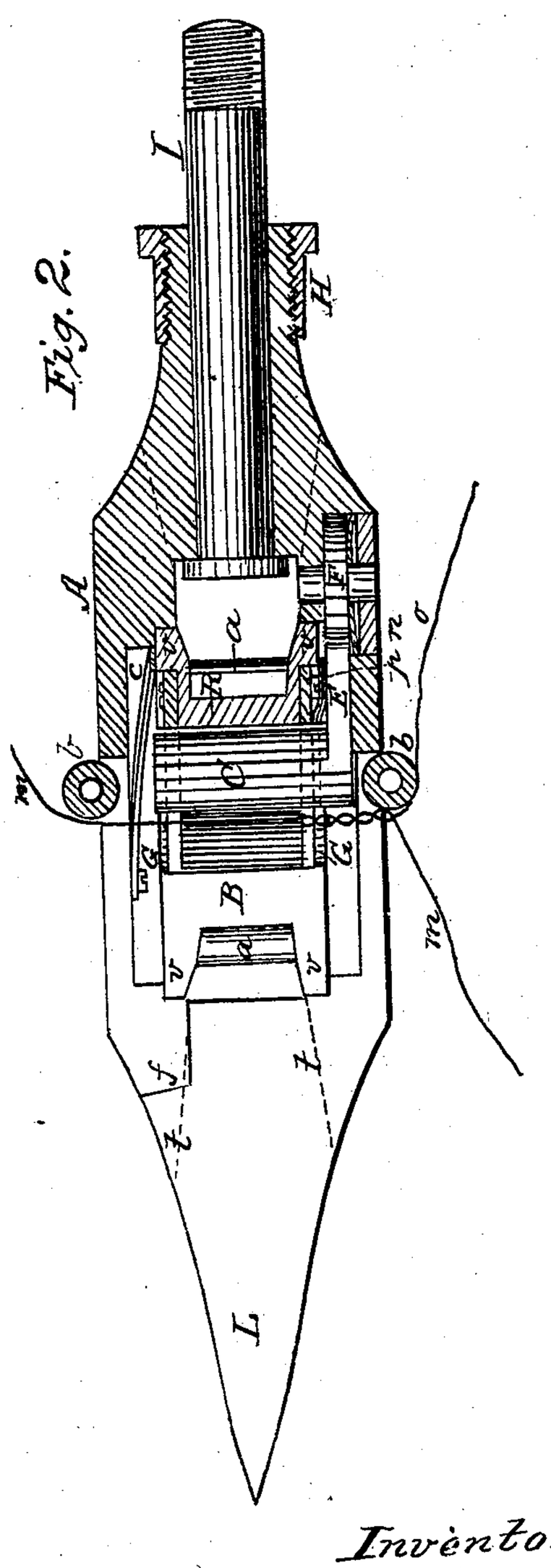


Fig. 2.



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2 Sheets—Sheet 2.

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Fig. 3.

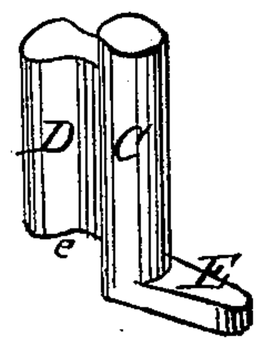


Fig. 6.

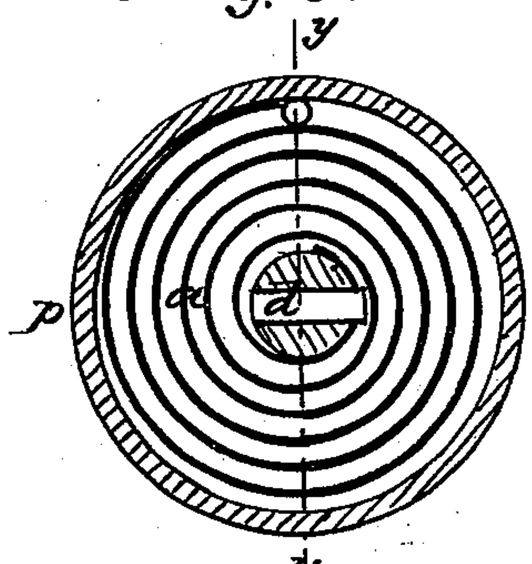


Fig. 4.

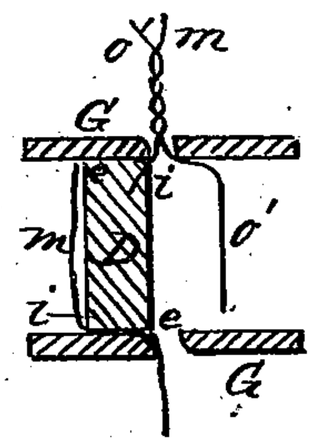
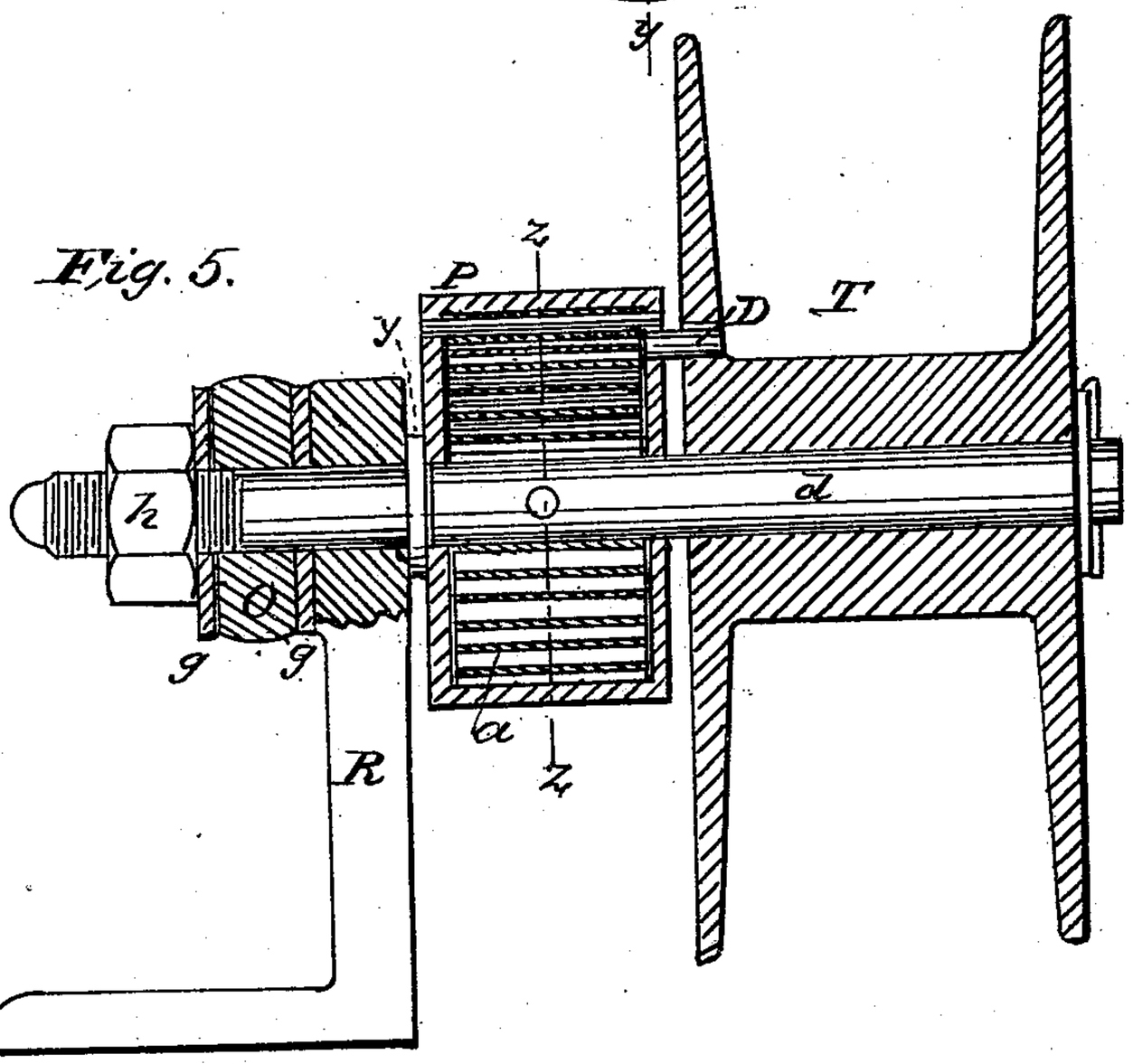


Fig. 5.



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UNITED STATES PATENT OFFICE.

S. D. CARPENTER, OF MADISON, WISCONSIN.

IMPROVEMENT IN GRAIN-BINDERS.

Specification forming part of Letters Patent No. **85,209**, dated December 22, 1868.

To all whom it may concern:

Be it known that I, S. D. CARPENTER, of Madison, in the county of Dane and State of Wisconsin, have invented certain new and useful Improvements in Machinery for Binding Grain; and do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making part of this specification, and to the letters of reference marked thereon, like letters indicating like parts wherever they occur.

To enable others skilled in the art to construct and use my invention, I will proceed to describe it.

This invention consists, first, in a novel shuttle for holding and carrying the wire around a bundle of grain, and then twisting the wire and cutting it off; and, second, in a novel arrangement of devices for regulating the tension on the wire, and for taking up the slack of the same, these devices being intended for use in connection with an improved grain-binder, for a patent on which I have recently filed an application, though they may be used with other binders also.

In the drawings, Figure 1 is a face view of the shuttle, with a portion broken away to show the interior arrangement. Fig. 2 is a longitudinal section, taken on the line *x x* of Fig. 1. Fig. 3 is a view of the cutter and holder, detached, in perspective; and Fig. 4 is a sectional view, illustrating the manner of holding and cutting the wire. Fig. 5 is a longitudinal section of the spool and attachments, and Fig. 6 is a sectional view, taken on the line *z z* of Fig. 5.

The shuttle consists of a shell, A, made in two parts, it being divided longitudinally, one forming the upper and the other the lower half of the shell A. Each part is formed with a projecting point or prong, L, on one side, and with a short projecting shoulder, *f*, on the other, which shoulder *f* fits into a corresponding recess in the adjoining prong L, where it is fastened by a screw, as shown in Fig. 1. The rear part of the shell is so formed that when the two halves are united they will form a tube or sleeve at that point to receive a bolt or wrist, I, which serves to support the shuttle, and on which it turns freely, a ferrule, H, being screwed onto the end of the tubular portion, and holding the parts firmly together. Within the shell is formed a circular recess, in which is located the twisting and cutting apparatus, there being an additional recess, of less diameter, in each half or side of the shell, beyond that in which the wheel B rests, these additional recesses serving to permit the insertion of a tension or friction spring on one side, and for the arm E of the cutter to move in on the other. The twister consists of a wheel, B, which has on its two faces a flange, *v*, which extends out beyond the cogs *a*, and which flanges form its bearing, they fitting in suitable recesses on the opposite inner faces of the shell, as shown in Fig. 2. Around the outer face of this wheel B is a series of cogs, *a*, which extend from one flange, *v*, to the other, as shown in Fig. 2; and vertically through the wheel there is a slit from its periphery to the center, as shown in Fig. 1, the wheel being so turned in said figure as to represent this slit as being opposite, and forming a continuation of the slit or space between the prongs L of the shuttle, in order to permit the wire to be drawn therein to the center of the twister-wheel B.

The shuttle or shell A has a channel cut along each edge to the depth indicated by the dotted lines *u*, Fig. 1, this channel being of a width equal to the width of the face of the cogs *a*, thus forming a space for the teeth *a* to project in, and for the teeth of the rack that operates the twister, as described in my application hereinbefore referred to, to enter, for the purpose of engaging with the teeth *a* of the wheel B.

The wheel B has a hole made near its center, of proper size, to receive the body or axis C of the cutter D, and it also has a recess or cavity formed on each side of the slit of sufficient size to permit the cutter D to be shoved therein, as indicated by the dotted lines in Fig. 1, where the cutter is represented as being swung around into the recess on the right of the slit.

The cutter D, with its axis C and arm F, is formed of a single piece of steel, in the form represented in Fig. 3. The cutter D is made to answer a double purpose, both cutting off and also holding the wire; and for these purposes it has its edges *e* formed so as to cut like a shear-blade against a fixed blade or an-

nular plate, G, of which there are two, one above and the other below the cutter, and both secured within the cavity in the wheel or twister B, as shown in Figs. 1 and 2, the ends of these plates G coming even with the slit in the wheel B, as shown in Fig. 1. The opposite corners *i* of the cutter D are slightly rounded or beveled, as shown more clearly in Fig. 4, the plates G being correspondingly rounded, for the purpose of permitting the wire to be pressed between the cutter and the plate G tightly, and thus holding it securely while the shuttle is being carried around the bundle and the band twisted, as hereinafter explained.

It will be observed that the cutting-edges *e* are located diagonally on opposite sides of the cutter D, and that the rounded edges *i* are arranged in the same position reversed, which is done for the reason that the shuttle is reversed each time a bundle is bound, so that, whichever side up the shuttle may chance to be, the cutting will always be effected at the same point, and the wire also be held at the same point uniformly.

In a shallow recess on one side of the shell A is located a stop, F, similar in construction to those used in watches, and as represented in Fig. 1, there being an arm, E, attached to and projecting from the axis C of the cutter, in such a manner as to operate on the stop F. The object of this arrangement is to regulate the number of twists to be given to the wire. There is a spring, *c'*, secured within the cavity to one part of the shell, which spring has its opposite end bearing on the wheel B, and thus serving, by its friction or pressure, to prevent the wheel from being moved accidentally, there being, also, a friction or spring plate, *n*, bearing on the stop F for a similar purpose, a cap, *l*, fitting in over the stop F, flush with face of the shell. A friction-roller, *b*, is secured on the outer face of the shell A at the point where the slit in the wheel B terminates, as shown in Fig. 2, for the wire to run over as it is drawn through the slit.

The operation of the shuttle is as follows: The loose end *o* of the wire is first secured by being inserted in the slit in the wheel B, and then pressing the cutter D over so as to jam or squeeze the wire between its round edge and the plate G, as represented in Figs. 2 and 4. The shuttle is then passed around the bundle, by the means described in my former application, and, as it comes around to the line of the wire where it is being drawn off the spool, the loose strand *m* enters the slit between the prongs L, and, as the shuttle advances, is forced into the slit to the center of the wheel B. By the time, or soon after, this has occurred, the teeth *a* on the wheel B will engage with the teeth of a rack, also described in my previous application, by which the wheel or twister B will be made to revolve, and thereby twist the fast and loose ends *o* and *m* of the wire, as represented in Fig. 2, the twisting taking place in the slit, below the cutter, on the side next to the bundle. The teeth on the rack which engage with the teeth *a* of wheel B, I make of such a number, in relation to those on the wheel, as to cause the latter to rotate four times, and as it rotates in the direction of the arrow, it will carry with it the cutter D, causing the arm E at each revolution to engage with one of the notches in the stop F, of which, as shown in Fig. 1, there are three. The arm E thus turns the stop F one notch at each revolution of the wheel B, and as it comes around the fourth time, the arm will strike against the stop at a point where there is no notch, and rest against it, as represented in Fig. 1, but on the opposite side. The wheel B continuing to move after the arm F strikes against the side of the stop, will carry the cutting-edge of the plate G, which, it will be remembered, is fast to the wheel, along with it, past the cutting-edge *e* of the cutter D, thereby cutting off the strand *m*, and, as the cutter is forced to the opposite side of the slit in the wheel, at the same time releasing the strand *o* that was held under the cutter, and, by the same movement, securing the strand *m* at the opposite end of the cutter, as previously described.

In Fig. 2 the wire is represented as just twisted, and the cutter D ready to be thrown to the opposite side of the slit, for the purpose of cutting off the strand *m* above the twist and securing it at the upper end of D.

In Fig. 4 the movement of the parts is represented as completed, the strand *m* having been cut by the upper edge *e*, and secured under the lower edge *i*, the strand *o'* which was held by the cutter D on the opposite side being released by the movement of the cutter, permits the bundle to drop, which thus draws the twisted wire with its projecting end *o'* out of the slit in the wheel and shuttle. The cavity in the wheel D, on each side of the slit and in which the cutter D moves, is made of such a size that there is but little more than enough space for the cutter D to rest in, the sides or walls of this cavity being indicated by dotted lines in Fig. 1.

The jamming or pressing of the wire between the rounded edge and end of the cutter and the plate G, together with the pressure of a spring, *p*, secured to the side of the wheel B, and pressing against the under face of the arm E, as shown in Figs. 1 and 2, serves to hold the cutter D in position with sufficient force to cause its arm E to turn the stop F without releasing the wire, until the stop has ceased to turn, and the arm is arrested in its movement by striking against the side of the stop, as above stated.

The pulling of the wire from the spool causes the shuttle to revolve half way on its wrist I, thereby turning the shuttle the other side up, so that at the next operation the twisting and cutting will be effected at the opposite side of the shuttle, this being rendered necessary by the fact that the strand from the spool when cut off is first secured

on one side of the shuttle, and the next time on the opposite side, the twisting always occurring on the lower side, next to the bundle, while the fastening of the strand always takes place on the side that is above or toward the spool, the turning of the shuttle by the tension of the wire occurring just after the bundle is released and at the instant the shuttle leaves the race in which is the rack that operates the wheel B, as described in my previous application.

In practice, I find about number twenty, American gage, to be the best sized wire for use; and I prefer to give it four twists, as less than that number of twists fails to secure it firmly, and more than that is apt to fracture the wire.

As the shuttle moves in a circle, the rack that operates the wheel B must also be formed on the arc of a circle; and to prevent the teeth of the rack from catching on the shuttle, or interfering with its movements, the channel in the sides of the shell A has its upper and lower walls formed on the arc of a circle also, as represented by the dotted lines *t* of Fig. 2, the outer walls or surfaces of the shuttle-shell A being also rounded off around its sides and edges, to prevent the wire from catching thereon.

It will be understood that the shuttle moves past the rack with one of its broadest faces or sides uppermost, it alternating at each revolution, moving with first one and then the other face uppermost.

The wire is wound upon a spool, T, Fig. 5, which spool is mounted loosely on an axis or pin, *d*, and between the spool and the arm R, that supports the axis *d*, is placed a case, P, which has wound within it a spring, *a*, one end of which is secured to the case P, and its opposite end to the axis *d*, as shown in Fig. 6, a pin, *w*, projecting from the side of the case, and fitting into a hole in the end of the spool, and thus serving to unite the two, so that when the spool is turned, by drawing off the wire, the spring *a* is wound up around the axis *d* until the force becomes sufficient to turn the axis *d* in its bearing in the support or bracket R, the object of this spring being to take up any slack in the wire that may occur between the spool and the shuttle, and thus keep the wire always taut, and prevent kinks or snarling.

To regulate the tension on the wire while being drawn off from the spool, I place upon the axis *d*, on the opposite side of the bracket R, a rubber disk or spring, O, between two washers, *g*, and outside of that a nut, *h*, there being a collar, *y*, attached rigidly to the axis *d*, and bearing against the opposite side of the support R, so as to increase the friction on the axis *d*, and still leave the spool free to turn when operated by the spring or the wire. By these means I can regulate the tension of the wire as may be desired. By screwing up the nut *h* the disk O is compressed, thereby increasing the friction of the parts, and, of course, increasing the tension or strain on the wire, and unscrewing the nut *h* decreases the friction, and, consequently, the tension.

This take-up and tension apparatus it is obvious may be applied to any binding-machine where wire or twine is used, whether this style of shuttle be used or not.

Having thus fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. A shuttle consisting of the shell A, having the twister B and cutter D arranged therein, all constructed and arranged to operate substantially as described.

2. The twister consisting of the flanged and toothed wheel B, having a slit for the entry of the wire, substantially as described.

3. The cutter consisting of the axis C, blade D, and arm E, substantially as described.

4. The combination of the wheel B and cutter D, constructed and arranged to operate substantially as and for the purpose set forth.

5. The combination of the wheel B, cutter D, with its arm E, and the stop F, all constructed and arranged to operate substantially as described.

6. In combination with a spool for holding the wire, the spring *a*, when arranged to operate as set forth, for taking up the slack.

7. The combination of the friction-spring O, the loose shaft *d*, with the collar *y* attached rigidly thereto, and mounted in a support, R, with the adjustable nut *h*, all arranged to operate substantially as described.

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