3 Sheets—Sheet 1.

D. McPHERSON.

GRAIN BINDER.

No. 188,162. Patented March 6, 1877.

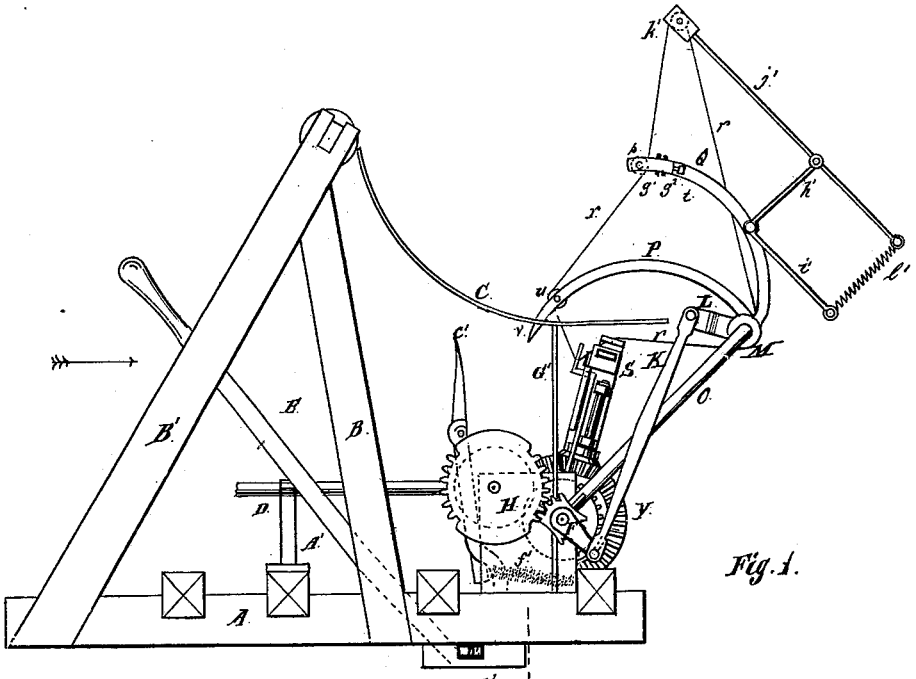

Fig. 1.

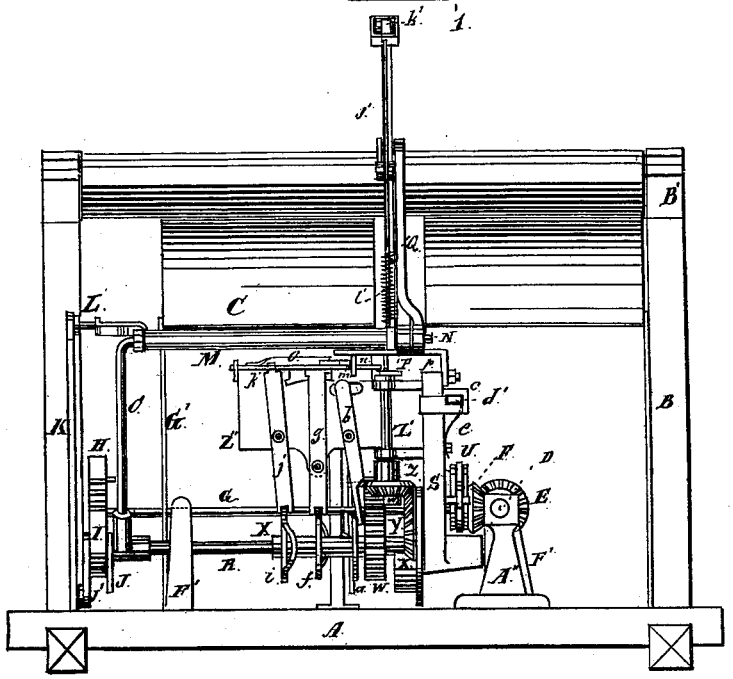

Fig. 2.

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GRAIN BINDER.

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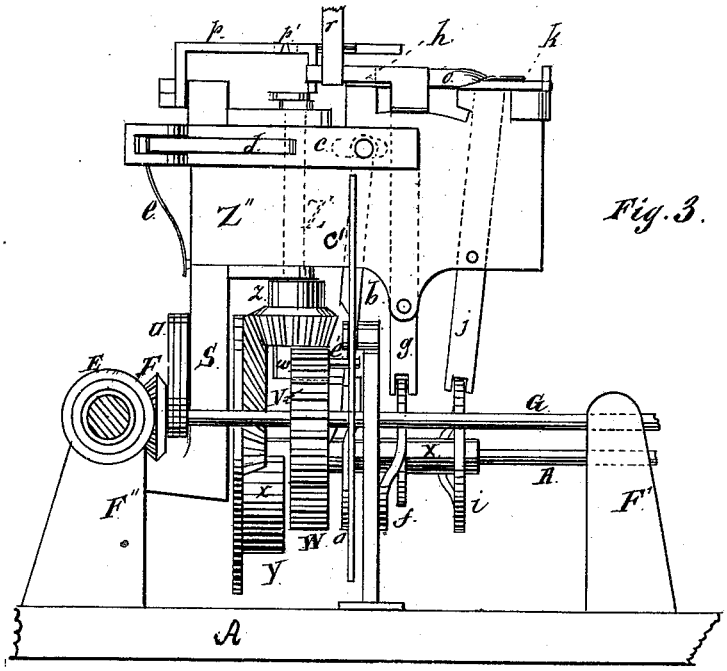

Fig. 3.

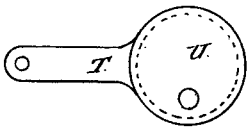

Fig. 5.

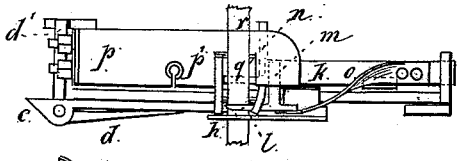

Fig. 4

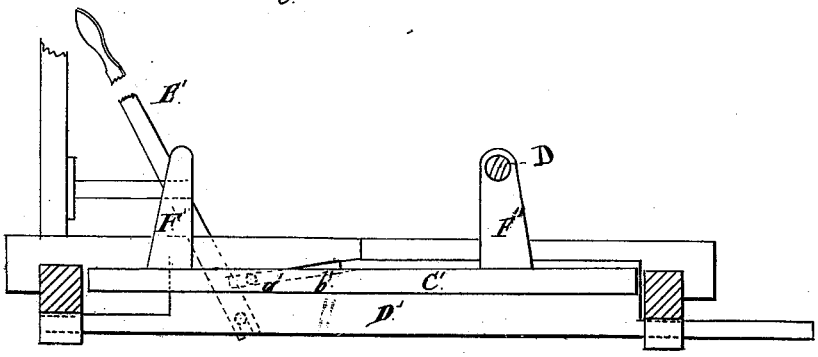

Fig. 6.

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GRAIN BINDER.

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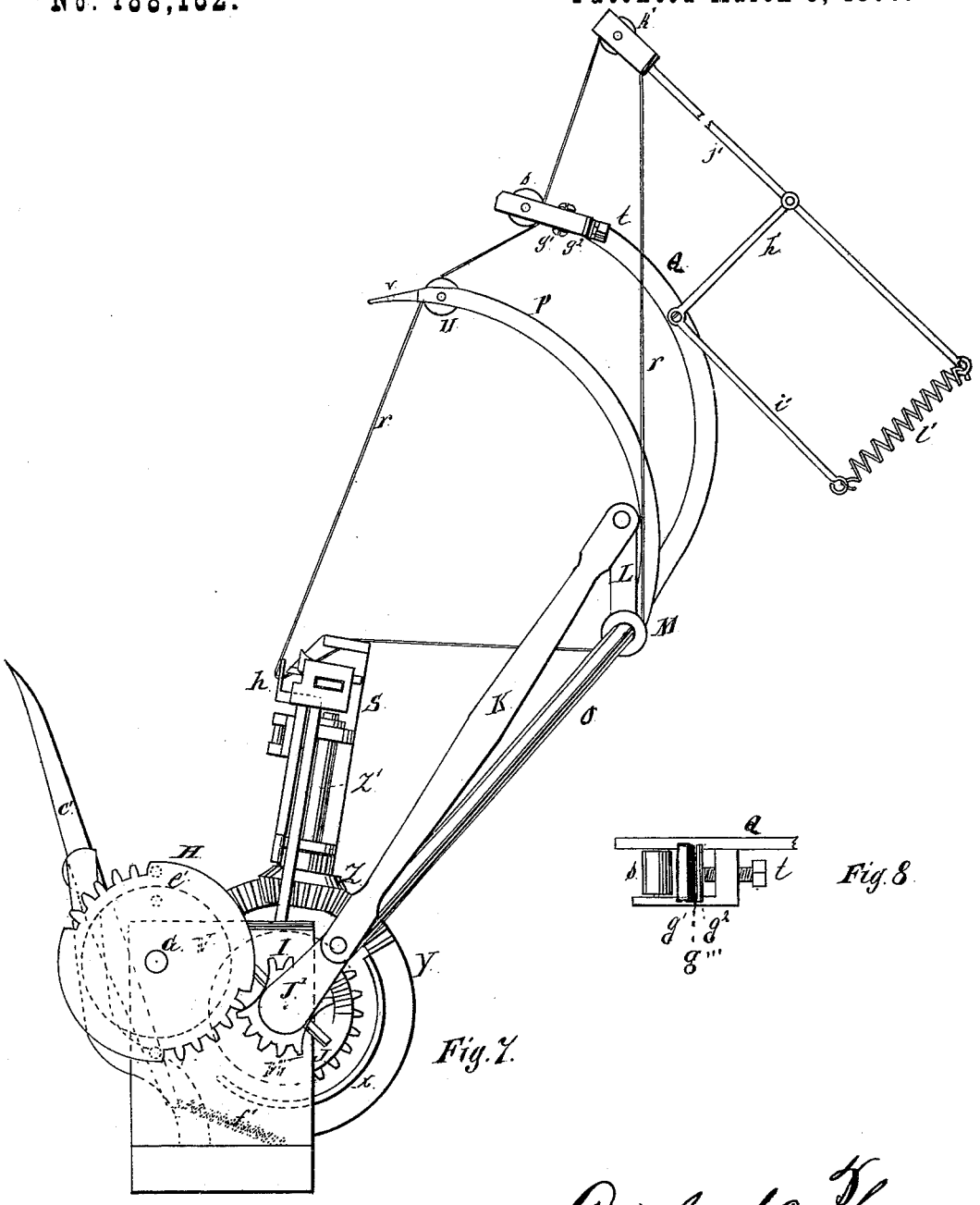

Fig. 7.

Fig. 8.

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UNITED STATES PATENT OFFICE.

DANIEL McPHERSON, OF CALEDONIA, NEW YORK.

IMPROVEMENT IN GRAIN-BINDERS.

Specification forming part of Letters Patent No. **183,162**, dated March 6, 1877; application filed June 5, 1876.

To all whom it may concern:

Be it known that I, DANIEL McPHERSON, of Caledonia, Livingston county, State of New York, have invented new and useful Improvements in Grain-Binders for Harvesters, of which the following is a full description, reference being had to the accompanying drawings, in which—

Figure 1 is an end elevation; Fig. 2, a side elevation; Fig. 3, an enlarged detail, looking in the direction of the arrow in Fig. 1; Fig. 4, a top view (enlarged) of the holding devices; Fig. 5, an enlarged detail of the eccentric cam; Fig. 6, a section at 1 of Fig. 1, showing the tilting frame and devices for operating it; Fig. 7, an enlarged end view of the devices shown; Fig. 8, a detail.

The object of this invention is to improve the construction of automatic grain-binders to be used in connection with harvesters, and it may be permanently attached to the machine, or it may be made as a separate attachment. Its nature consists in the use of a single cam attached to the twister-post to move the same back and forth; in a lever so arranged as to drive the wire arm or shaft up close to the twister, so that the binding-wire will be caught by the twister; in the use of cam and lever for operating a slide with which a device is connected for grasping the binding-wire; in the use of a second cam connected to the first, and combined with a lever and a device arranged to hold an endless strap, and at the same time force the binding-wire into the twister; in the use of a third cam connected to the others, and combined with a lever and sliding pinchers, for the purpose of grasping an endless strap and holding it until the bundle is bound; in the use of devices for operating the endless strap or compressor.

In the drawings, A represents the frame-work; B B′, parts of an elevator-frame; C, grain-receiver; D, shaft or axle of the driving or main wheel; E F, miter-wheels; G, shaft of the wheel F; H, spur-wheel on the outer end of the shaft G, and secured thereto; I, pinion or spur-wheel on the end of the shaft R, and revolving thereon; J, plate provided with projections or spurs for forcing the pinion I into gear with the wheel H; J′, crank permanently secured to the pinion I; K, pitman; L, crank permanently secured to the sleeve or collar M; M, sleeve or collar on the shaft M′; N, shaft supporting needle-arm; O, bent portion or support of the shaft N; P, needle-arm or needle; Q, stationary bar or arm on the end of shaft N; R, shaft carrying the twisting-post and other devices; S, swinging post carrying the twisting and holding devices; T, crank of the eccentric or cam U; U, eccentric for moving the post S; V, cog-wheel permanently secured to the shaft G; W, cog-wheel permanently secured to the collar X; X, collar on the shaft R; Y, bevel-wheel having cogs only on one-half thereof; Z, bevel-wheel on the end of the twister-shaft; Z′, twister-shaft; Z″, frame or support for the twisting and holding devices permanently secured to the swinging post S; *a*, cam permanently secured to the collar X, near the wheel W; *b*, lever pivoted near its middle, its lower end engaging with the cam *a*; *c*, sliding bar on the upper end of the lever *b*; *d*, tooth or movable piece pivoted to the bar *c*; *d′*, rearward extension of the tooth *d*; *e*, spring for opening and closing the movable piece *d′*; *f*, a second cam permanently secured on the collar X; *g*, lever pivoted near its middle, its lower end engaging with the cam *f*; *h*, arm permanently secured on the upper end of the lever *g*; *i*, a third cam permanently secured to the collar X; *j*, lever pivoted near its middle, its lower end engaging with the cam *i*; *k*, sliding bar on the upper end of the lever *i*, which also forms one jaw of the pinchers; *l*, movable jaw of the pinchers; *m*, projection on the rear end of the jaw *l*; *n*, stop against which the projection *m* strikes, and closes the movable jaw *l*; *o*, spring for opening the movable jaw *l*; *p*, guard-plate over the twisting devices; *p′*, opening and slot in the plate *p*; *q*, plate with a curved edge, over which the strap *r* passes, and between which and the movable jaw *l* of the pinchers it is caught; *r*, endless strap or compressor; *s*, roller in the end of the bar Q; g^1 g^2, two movable plates in the rear of the roller *s*, between which rubber or other elastic material may be placed; *g‴*, interposed rubber; *t*, set-screw for operating the two plates with the rubber, to give the proper tension to the strap *r*; *u*, roller in the end of the

needle-arm P; *v*, eye of the needle or arm P; *w*, stop on the twister-shaft Z′; *x*, projecting ridge on the bevel-wheel Y; its edge comes in contact with the stop *w* during a half-revolution of the wheel Y, and prevents the twister from turning while the needle P descends; A′ A″, journal-supports for the shaft D; C′, cross-bar to which the binding devices are attached, and upon which they are supported, so that when tilted they will all move together and operate in any position in which they may be placed; D′, sliding bar for tilting the cross-bar C′; *a′*, pin on the tilting cross-bar C′; *b′*, slot in the sliding bar D′, in which the pin *a′* works; E′, lever for operating the sliding bar D′; F′ F″, journal-bearing supports located on the tilting cross-bar C′ for the shafts G and R; G′, upright posts for supporting the grain-receiver C; *c′*, lever for forcing the needle P up close to the twister; *e′*, pin on cog-wheel V for operating the lever *c′*; *f′*, spring for returning the lever *c′*; *h′*, rod secured to the bar Q, and having an extension, *i′*; *j′*, rod pivoted to the top of *h′*; *k′*, roller located at the forward end of *j′*, over which the strap *r* passes; *l′*, coil-spring secured to the ends of *i′* and *j′*.

The frame-work A is made in any suitable manner to be applied to a harvesting-machine which has an elevator, B B′, and a grain-carrier, which may be made in any of the usual forms, and are, therefore, not further described.

The main or driving wheel (not shown) is located, as usual, on the shaft or axle D, which has its journal-bearings in the brackets or supports A′ A″. This shaft D also passes through the journal-support F′ on the tilting cross-bar C′.

On this shaft D, and near the journal-support F″, is located a miter-wheel, E, which engages with another miter-wheel, F, and drives the shaft G, and rotates the cog-wheel V and spur-wheel H, which are permanently secured thereto.

The construction and operation of the spur-wheel H, pinion I, with plate J thereon, pitman K, cranks J′ and L, swinging support O, collar M, and needle P, are similar to that of such parts shown and described in my application filed February 3, 1876, except that the needle P is permanently secured to the collar M, instead of to the shaft N.

R is a fixed shaft, having its supports in F′ F″, which are secured to the tilting cross-bar C′. Upon this shaft is located the twisting-post S, which post is moved back and forth by means of the crank T and eccentric U, the eccentric being operated from the shaft G, to which it is connected. To this post S is attached the frame Z″, which carries the holding devices and the twister-shaft Z′, so that as the post is moved back and forth it will carry with it the other devices.

The top of the twister-shaft Z′ is to be provided with any twisting-hook and cutter which do not require a reverse movement to operate them. The twister and cutter are not shown.

The twister-shaft Z′ is located in suitable bearings, and is operated by means of the cogs on the wheel Y engaging with the cogs of the beveled wheel Z at the bottom of the twister-shaft Z′.

The wheel Y is located on the shaft R, next to the post S, and rotates thereon. This wheel is provided with cogs only half the way around, the other half having a flange or projection, *x*, which engages with the stop *w* on the beveled wheel Z, and prevents the rotation of the twisting devices while a gavel is being formed, and during the descent of the needle.

On the shaft R is also located the collar X, to which collar is permanently secured the cog-wheel W, which wheel engages with the cog-wheel V on the shaft G, and rotates the collar and the devices thereto attached. This wheel W also operates the cog-wheel Y. To this collar X are permanently attached the three cams *a f i*, so that as the collar is rotated the cams will operate their several devices.

The cam *a* engages with the lower end of the lever *b*, which lever is pivoted near its middle to the frame Z″, and operates the sliding bar *c*, moving it back and forth. To the end of this bar *c* is pivoted a tooth or jaw, *d*, which jaw has a rearward extension, *d′*, with which the spring *e* comes in contact. As the bar *c* is pushed forward by means of the cam *a* and lever *b*, the tooth or jaw *d* will be closed when the extension *d′* strikes against the frame Z″, and on the return movement of the bar *c* it will be opened by means of the spring *e*, the object of this device being to grasp and hold the end of the binding-wire after a bundle has been bound. The cam *f* engages with the lower end of the lever *g*, which is pivoted below its center to the frame Z″, and operates the bar *h*, which bar is located at the top of the lever, and, as shown, is a part thereof. The object of this device is to hold the endless strap while the needle-bar is ascending. The cam *i* engages with the lower end of the lever *j*, which is pivoted near its center to the frame Z″, and operates a sliding bar, *k*. This bar *k* slides back and forth in suitable supports located on top of the frame Z″, and to it is attached the spring *o*. To this bar is pivoted the movable arm or jaw *l*, which jaw is closed by means of the extension *m* coming in contact with the plate or projection *n*, as the bar *k* is moved forward, and is opened by means of the spring *o* engaging with the rear end thereof as the bar *k* is moved back. The bar *k* slides back or in rear of the plate *q*, and the jaw *l* closes against it. The object of this device is to grasp the endless strap while the twisting is being done, and during the time that such strap is released from the bar *h*. The parts are to be so timed that the cam *f* and lever *g* will draw back the bar *h* and release the endless strap *r* when the nee-

dle-bar has nearly completed its descent, at which time the cam *i* and lever *j* will cause the bar *k* to move forward, closing the movable jaw *l*, so as to grasp the strap *r* before the bar *h* releases it. As the needle-bar ascends, the pinchers will be withdrawn, and the bar *h* advanced to hold the strap. By this arrangement the endless strap will be held, either by the bar *h* or jaw *l*, during both the ascent and descent of the needle. The cam *a* is to be so timed that it will advance the bar *c* and release the binding-wire when the twisting commences, and almost immediately return and grasp it again, and hold it during the ascent of the needle, so that it will be ready to be carried around the next bundle by the descent of the needle. The wheel V is provided with a pin, *e'*, which comes in contact with the lever *c'*, and drives it forward toward the binding devices. To the lower end of this lever *c'* is attached a spring, *f'*, by means of which the lever is returned. The upper end of the lever *c'* comes in contact with the end of the needle, and the object of the device is to force the needle up to the twister, so that the binding-wire will be caught thereby. The bar C', as shown, is pivoted, by means of the support F'', to the axle D of the main or driving wheel. This bar C' is provided with a pin, *a'*, which engages with the slot *b'* of the sliding bar D', which bar D' is operated by means of the lever E'. (See Fig. 6.) By this means the bar C' can be tilted so as to bring the binding devices, which are attached thereto, in such a position as to bind the gavel near its center.

It is desirable to compress the bundle into shape by means other than the binding-wire, in order to save any undue strain upon the wire. This I accomplish as follows: To the end of the shaft N is permanently attached an arm, Q. On the end arm is located a roller, *s*, and attached to this arm is a support, *h' i'*. To the upper end of *h'* is pivoted a rod, *j'*, in the end of which is a roller, *k'*. To the rear end of the rod *j'* and *i'* is secured a spring, *l'*. The end of the needle P is also provided with a roller, *u*. Over these rollers *u*, *s*, and *k'*, and around the collar M, the endless strap *r* passes, as shown in Figs. 1 and 7. The endless strap *r* being held at one point by the bar *h*, as before described, as the needle bar descends it will carry the strap around the bundle or gavel and compress it into shape. The plate *q* on the frame Z'', over which the strap *r* passes, should be rounded, so as not to unnecessarily wear the strap at that point. The spring *l'* permits the compressing-strap *r* to pass around the bundle, and it also serves the office of a take-up when the bundle is released.

The take-up section *h'*, *i'*, *j'*, *k'*, and *l'* may be omitted, as the endless strap will operate well without it, for the bundle or sheaf will act as a sufficient take-up.

The receiver C is made in two parts, as usual, and is supported upon the tilting cross-bar C' by means of suitable standards or posts G'.

In operation, cut grain is received upon the receiver C, the parts being in the position shown in Fig. 7, in which position the binding-wire will pass from the spool (not shown) down through the eye *v* of the needle P; thence through the hole *p'* of the plate *p*; thence down to the holding device *c d*, where its end is held. At the same time the bar *h* will hold the compressor-strap *r*. As the machine advances the bent arm O will be carried forward by means of the wheel I, pinion J, and pitman L, and the needle-arm P will be carried down through the accumulated grain.

The operation of the compressor is as follows: The endless strap *r* is locked below by the gripers *k l*, and is held above between the roller *s* and plate *g'* of the arm or support Q by pressure from the spring *g'''*, regulated by the screw *t*, to give the gavel the required pressure or compression. As the arm P descends the strap is carried around the gavel, bringing into shape and compressing it. The arm P brings the strap around against or to the frame or head Z'', at which time the arm or bar *h* is advanced so as to catch and hold it at that point. The strap remains in this position until the twisting is completed, when the arm or bar *k* is withdrawn, releasing the lock, leaving the rear of that portion of the strap used in compressing free, so that the bundle falls out, or is free to fall out behind. The bar *k* is advanced as soon as the bundle is released, and locks the strap again close to the bar *h*, when the operation is ready to be repeated. By this operation the band or strap *r* is made to travel around or revolve by steps, an advance section thereof being used as the bundles follow each other, and by thus locking and releasing the compressor-band from below, or at the twister, it is freed from the bound bundles, so as not to interfere with their discharge, and I am enabled to use a strong compression. The amount of the compression is regulated by the set-screw *t*, so that heavy or light compression may be had, as desired.

When the needle has descended to its lowest point, the pin *e'* will cause the lever *c'* to move forward and force the needle a little farther forward, so as to bring the binding-wire within reach of the twister. The twister is then operated by means of the wheel Y, at which time the binding-wire is released from *c d* and grasped again, as before described. Then the wire will be twisted and cut, and the bent arm O carried back. As the needle ascends the parts are returned to the position shown in Fig. 7, ready for the next bundle, when the same operation is repeated.

At the same time that the bent arm O, and the parts thereto attached, are advanced, the post S, and the twisting and holding devices connected therewith, will be advanced by

means of the crank T and eccentric U, and when the bent arm O is returned the post S and the other devices, will also be returned.

What I claim as new, and desire to secure by Letters Patent, is as follows:

1. The eccentric U and crank T, in combination with the shaft G and twister-post S, substantially as and for the purposes specified.

2. The shaft R, collar X, cam *a*, and lever *b*, in combination with the sliding bar *c* and movable jaw *d*, frame Z″, and spring *l*, substantially as and for the purpose set forth.

3. The combination of the shaft R, collar X, cams *f i*, levers *g* and *j*, with the bars *h* and *k*, for holding and locking the strap *r*, substantially as specified.

4. The endless strap *r*, in combination with the support Q, needle-arm P, and two alternately holding and releasing bars located at or near the twister for compressing gavels and releasing bundles, substantially as specified.

5. The roller *s* of the support Q, plates g^1 g^2, spring g''', and set-screw *t*, in combination with the endless belt *r*, for adjusting the tension, substantially as set forth.

6. The endless strap *r*, in combination with the support Q and roller *s*, needle-bar P, and roller *u*, rod or bar *j′*, roller *k′*, and spring *l′*, and holding devices *h* and *k l*, substantially as described.

7. The lever or pivoted bar *c′*, in combination with the wheel V and pin *e′*, for forcing the needle-arm up to or against the twister, substantially as specified.

8. The tilting bar C′, having a pin, *a′*, in combination with the sliding bar D′, provided with a slot, *b′*, and lever E′, substantially as described.

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