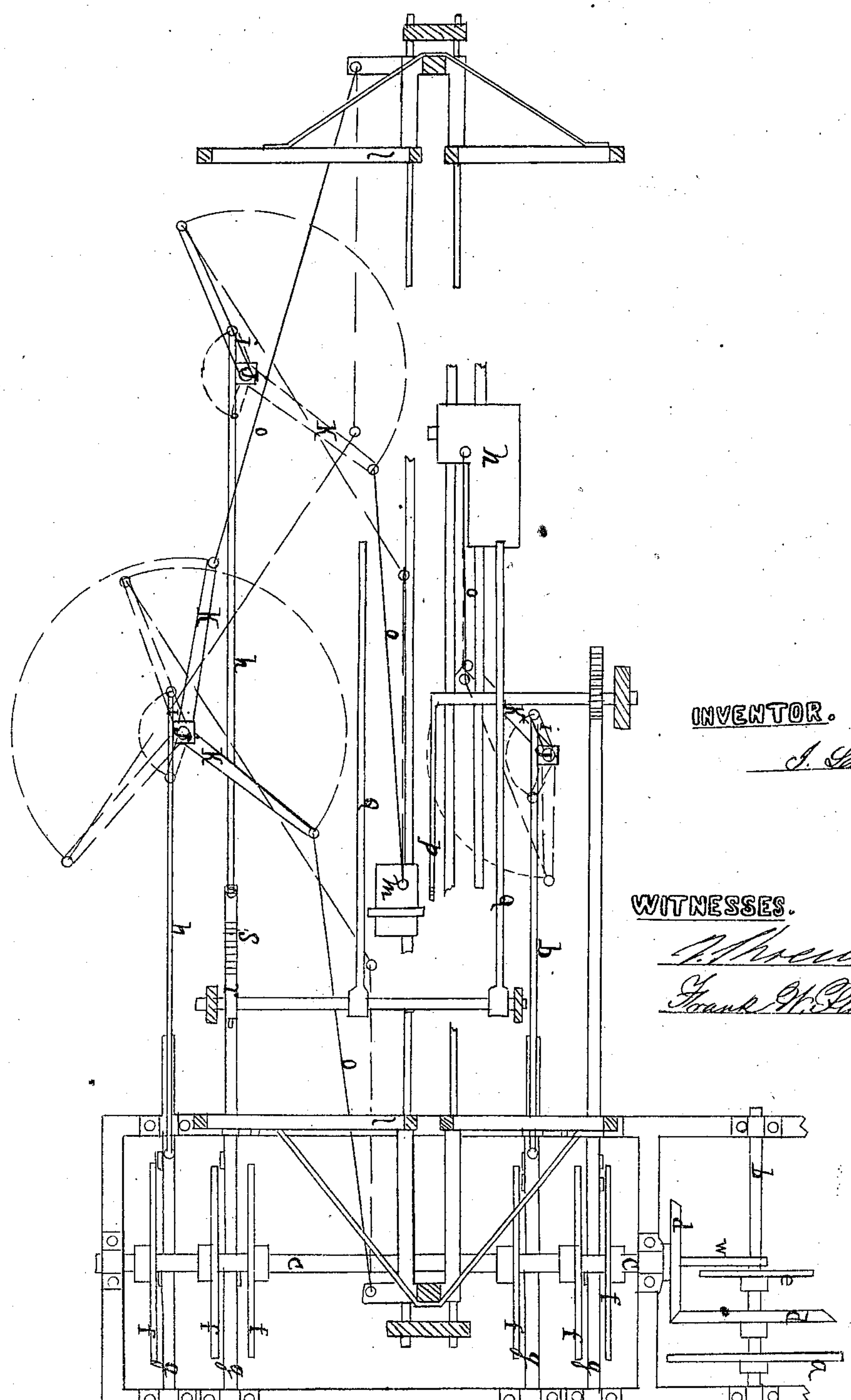
4 Sheets. Sheet 1.

I. Lancaster.
Grain Binder

No. 54177

Patented April 24, 1866.



INVENTOR.

I. Lancaster.

WITNESSES.

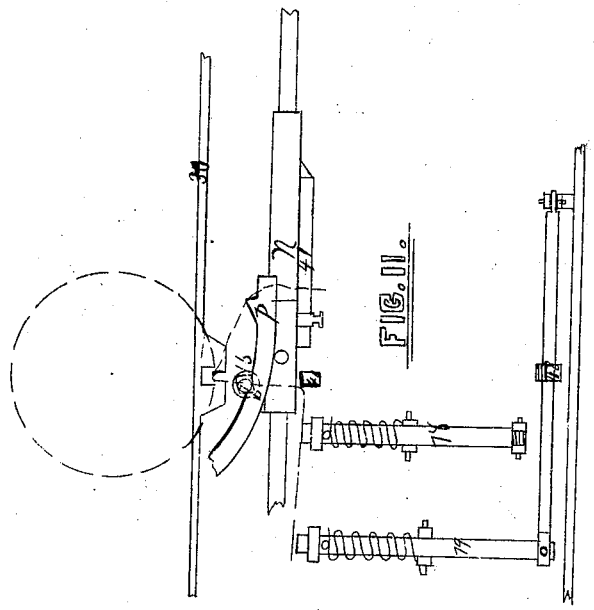
T. Shoemaker

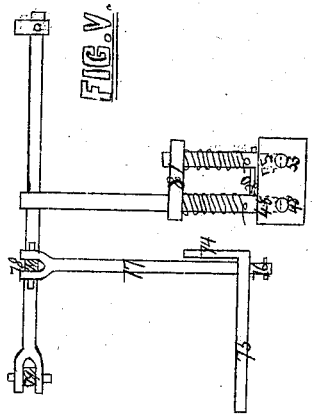
Frank W. Plummer

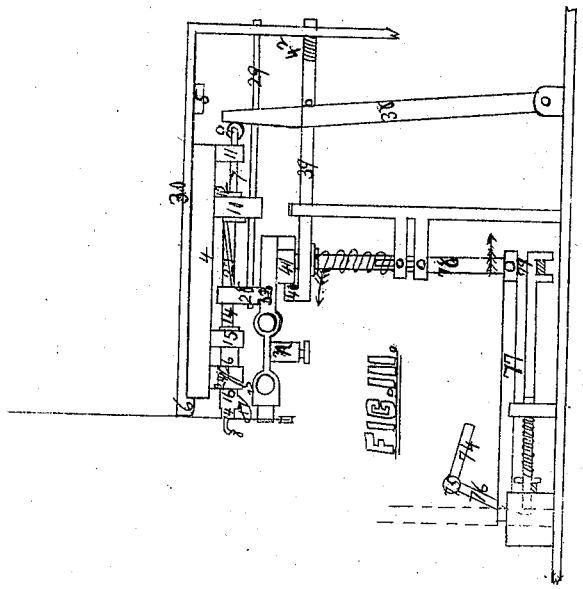
4 Sheets. Sheet 2.

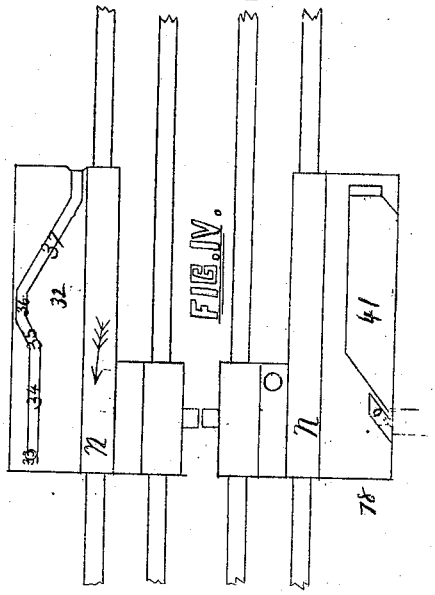
L. Lancaster.
Grain Binder.

No. 54177 Patented. April. 24. 1866.









INVENTOR.

L. Lancaster.

WITNESSES.

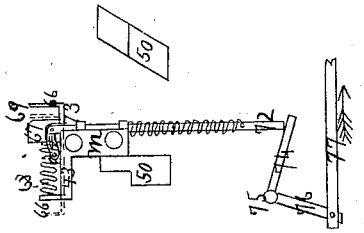
Frank W. Plumpe

4 Sheets. Sheet 3

I. Lancaster.
Grain Binder.

No. 54177

Patented. April. 24. 1866



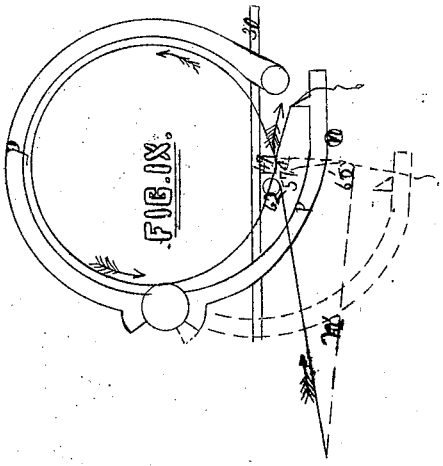


FIG. IX.

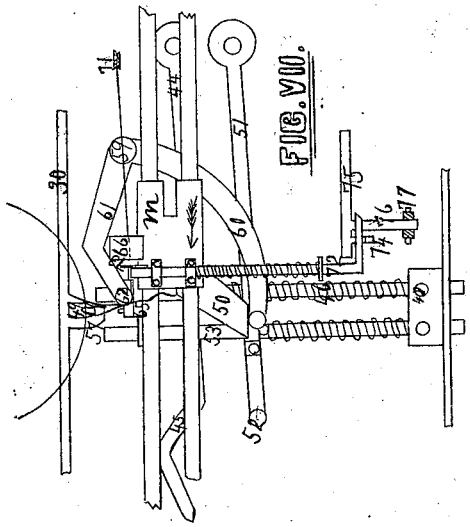
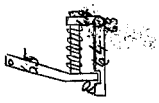


FIG. VII.



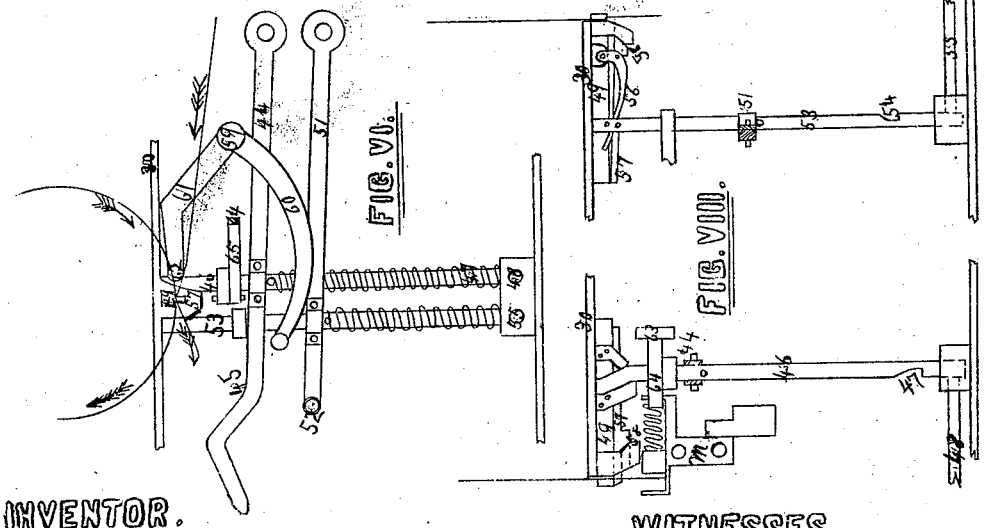


FIG. VI.

FIG. VIII.

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I. Lancaster

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C. Sherman Jr.

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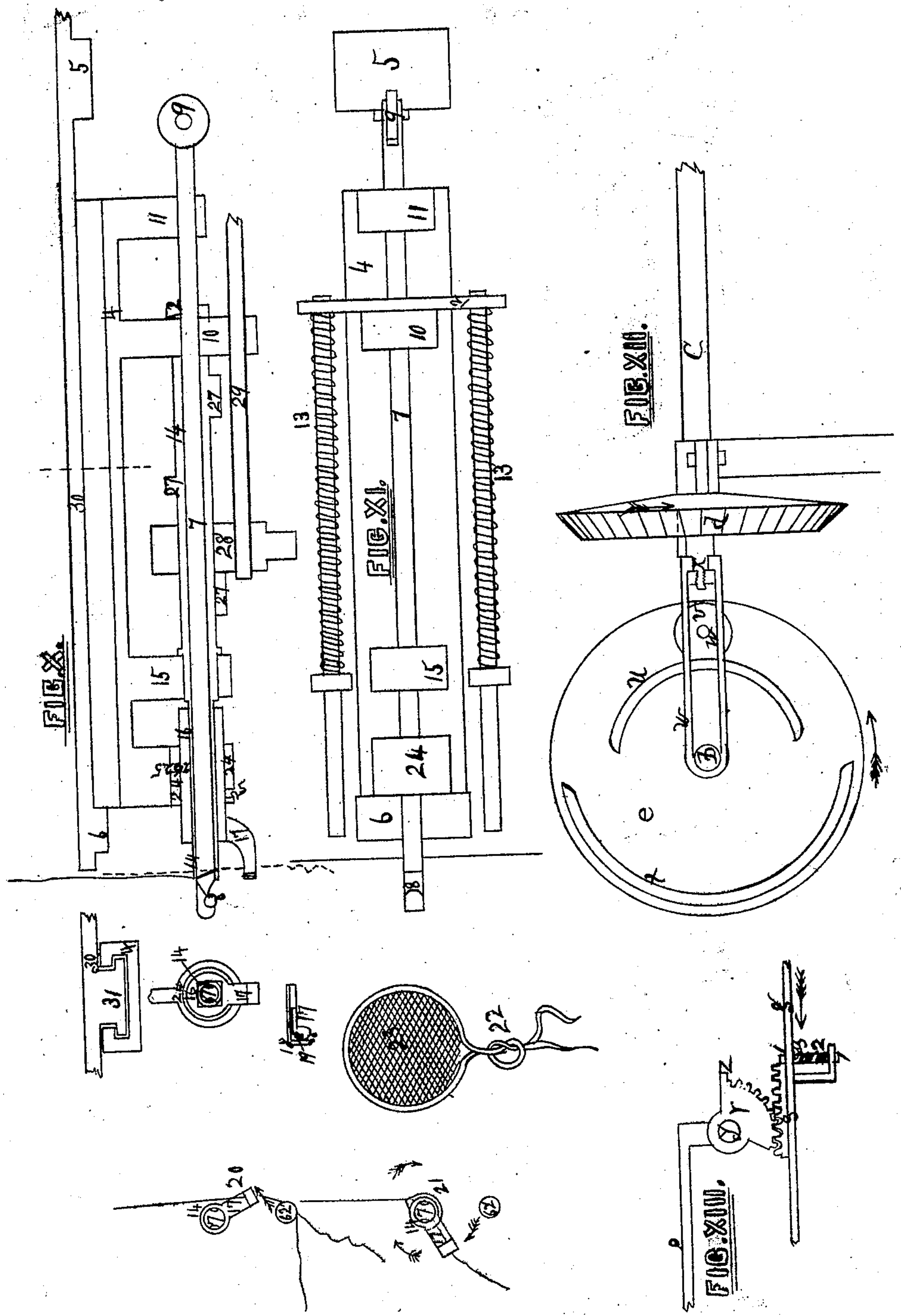
4 Sheets. Sheet 4.

I. Lancaster.
Grain Binder.

No. 54177 Patented April 24, 1866.



WITNESSES.

[signature]

Frank W. Plummer

INVENTOR.

I. Lancaster.

UNITED STATES PATENT OFFICE.

ISRAEL LANCASTER, OF BALTIMORE, MARYLAND.

IMPROVEMENT IN GRAIN-BINDERS.

Specification forming part of Letters Patent No. 54,177, *dated April* 24, 1866.

To all whom it may concern :

Be it known that I, ISRAEL LANCASTER, of Baltimore, in the county of Baltimore, in the State of Maryland, have invented a new and useful Machine for Binding Grain; and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawings, making a part of this specification, in which—

Figure 1 is a horizontal plan of the machine seen from above, and showing the method of communicating motion to the principal parts. Fig. 2 is an elevation of the machinery operated by the sliding block *n* and seen in the direction of the butt of the sheaf and at right angles to its axis. Fig. 3 is a side elevation of the same. Fig. 4 is a horizontal view of the upper and lower sides of the block *n*. Fig. 5 is a horizontal view of devices seen at and explained by Figs. 2 and 3. Fig. 6 is an elevation of the machinery operated by the sliding block *m*, and seen in the direction of the head of the sheaf and at right angles to its axis. Fig. 7, the same, showing the three levers depressed and the block *m* in position for receiving the cord forming the sheaf-band. Fig. 8 shows an elevation of opposite sides of Fig. 6. Fig. 9 shows the position of the cord when around the sheaf, and its place when acted upon by the device which fastens the ends or ties the knot. Fig. 10 is a full-size vertical section through the axis of the shaft 7 of the knot-tying device. Fig. 11 is a horizontal view of the same seen from below, showing the spiral springs which partially operate the shaft to which they are attached. Fig. 12 is a vertical elevation of the mechanism for throwing in and out of gear the devices for operating the reciprocating bars, with section of the coupling. Fig. 13 is a vertical elevation of device for operating the sheaf-discharger. The detached drawings on the sheet containing Fig. 10 belong to that figure.

The nature of my invention consists in certain improvements upon a grain-binding machine, which improvements are hereinafter set forth, and which are intended to be applied to any reaper, to bind the grain as it is cut, and to be operated solely by the horse-power of the reaper.

To enable others skilled in the mechanic arts to make and use my invention, I will proceed to describe its construction and operation.

The way of communicating motion to the machine is seen at Fig. 1, where *a* is a rag-wheel, around which passes a chain-band from the reaper, giving the axle *b* one revolution for every sheaf raked upon the platform of the binder. This shaft is geared to the shaft *c* by means of the bevel-wheels *d d* at the rate of two revolutions of *c* to one of *b*. The shaft *c* has a reciprocating motion given it by the wheel *e*, so that at one revolution it is geared with one side of the reciprocating bars *g g g g* by means of the cranks *f f f f f f*, and at the other revolution they are either thrown out of gear entirely or are geared with the other side of the bars. Three of these bars are attached by connecting-rods *h h h* to the short arms *i i i* upon the vertical shafts *j j j*. Upon these shafts are also the long arms *k k k k*. These short and long arms are alternately thrown into the positions shown by the lines and back by the action of the reciprocating bars. The wings *l l*, the block *m*, the block *n*, are moved forward and back upon their respective guide-rods by means of the rods *o o o o*, connected with the long arms *k k k k*, as shown by the lines. The hinged arm *p*, which takes the band from the block *m* and places it around the sheaf, is moved by one of the bars *g*, by means of a rack and pinion. The sheaf-discharger arms *q q* are thrown to a vertical position, carrying the bound sheaf with them, by means of a sectional gear, *r*, working into a sliding rack, *s*, on the bar *g*.

Upon the face of the wheel *e*, Fig. 12, are placed two segmental projections, *t u*. As *e* revolves in the direction of the arrow, the wheel *v* travels on the outer edge of *u* and on the inner edge of *t*, making a horizontal movement of, suppose, five-eighths of an inch in changing from one to the other. This gives a reciprocating movement to the shaft *c* by means of the coupling seen at *w w*, as shown in the section at *x*. This movement regulates the gearing with the bars *g g g g*, as before noticed.

Fig. 13, at *r*, is a sectional gear placed upon the shaft *y* of the sheaf-discharger. This section is made with a projecting part, *z*. The

sliding rack *s* is held to its place by a stop, 1 1, which stop is held to its position by a spiral spring, 2, working against a pin, 3. When the bar *g* moves in the direction of the arrow it carries the rack *s* with it, which revolves the shaft *y*, by means of the gear *r*, until the bars *q q* are thrown to a vertical position, when the projecting part *z* strikes the stop 1 1, forcing it below the bottom of the rack, when the discharger immediately returns to its original position, carrying the rack with it over the head of the stop 1 1. On the return of the bar *g* the spring 2 forces the stop to its original position.

The construction and operation of the device for forming the knot in the lapped ends or the sheaf-band after it has passed round the sheaf is thus explained, viz: At Fig. 11 is seen a sliding frame, 4, which plays between the stops 5 and 6. This frame sustains a shaft, 7, into one end of which is worked the notch 8, and on the other end of which is placed the friction-wheel 9. This shaft plays endwise as far as the distance between 10 and 11, which are stops and bearings. A cross-bar, 12, is fastened to the shaft, at the ends of which work the spiral springs 13 13. These springs force back the shaft 7 until the bar 12 strikes the bearing 11, when the whole sliding frame is forced against the stop 5. The part of the shaft 7 which passes through the stop 11, or bearing 11, is square, to prevent any motion upon its axis. The other part of the shaft is round.

Upon the shaft 7, Fig. 10, and between the bearing 10 and the commencement of the notch 8, is placed the tube 14 14. After the passage of this tube through the bearing 15, and to within one-half of an inch of the end at 8, it is worked square. The half an inch at the end is worked round, for the passage around it of the cord, as shown by the lines. Upon this square part is fitted the piece 16, working freely lengthwise. The external surface of this piece is round, as seen in the end view. To the outer end of this piece 16 is fitted an arm, 17. Upon this arm is fitted an angular spring, 18, and a spring of steel wire, 19, plays against the edge of this spring and arm. When this arm is thrown against the cords, as seen at 20, they open the spring 18, press down the spring 19, and pass into the hook-shaped arm 17, as seen by the small circles. The arm then reverses its motion, passes in the direction of the arrows at 21 entirely around the tube 14, and as it completes its motion is thrown forward, passing the ends into and across the notch 8, as seen at 21 and by the lines at Fig. 10. The shaft 7 is now drawn into the tube by the spiral springs 13 13, carrying the ends of the cord with it, as can be readily seen at 21, when the sliding frame passes against the stop 5, carrying the tube 14 with it, which slips the cord off of the end of the tube, forming a knot, as seen at 22. The sheaf 23 is now thrown from the platform by the sheaf-discharger, tightening the knot in doing so, and drawing the surplus ends out of the tube 14 and arm 17.

The proper lengthwise motion of the arm 17 to strike the cords, as at 20, to pass behind the cord depending from the sheaf, and above the tube 14, and to pass forward, placing the cord in the notch by doing so, is given by an irregular groove, 25 25, in the collar 24, which passes round the piece 16. In this groove plays the pin 26, which gives the required motion. The rotary motion is given by the reciprocating block 28 playing on the spiral thread 27 27 27 on the tube 14. 29 is a guide-rod for the block 28. The slide that carries the frame 4 is seen at 31, which is a transverse section through the dotted line in Fig. 10. 30 is the platform of the binder.

The hinged arm *p* takes the cord from the block *m*, Fig. 10, and passes it round the sheaf to the position seen by the lines in Fig. 9. The grooved wheel 62 is then depressed, carrying the end of the cord attached to the spool to the position 62′, as seen by the dotted lines. The arm *p* now opens, carrying the other end of the sheaf-band into the same grooved wheel at 62′. The cords are now in position between 57 and 62′ to be acted on by the knot-tying device. When the movement seen at 20, Fig. 10, is made, the arm *p* has opened so far as to draw the end of the cord out of the arm, thus releasing one end, and the other end is cut between 62′ and the spool which holds it. The two ends are now only held by the pressure of the wire spring 19 upon them, in the hook of the arm 17, Fig. 10. The arm now revolves, drawing the cord through it as it passes round the tube 14.

The construction and operation of the device for receiving and delivering the cord to the arm *p* is as follows: At the end view of the block *m*, Fig. 7, is shown the sliding jaw 66 66. Between the back end of this jaw and the fixed jaw 67 works the spiral spring 68, holding the jaw 66 in contact with 67, as shown by the dotted lines. Upon the pivot 63, Fig. 8, is fixed the angular piece 64 64. In the long arm of this piece is worked the notch 70, to receive the end of the bent bar 65. From this bar to the short arm 64 works the spiral spring shown, which constantly holds the long arm 64 to the end of 65, and at the same time throws out the piece 65.

As the block *m* approaches its position seen at Fig. 7, the back part of the jaw 66 strikes the piece 65 near the pivot, passes up the inclined part, opening the jaws as it does so, until it strikes the arm 64 at 70, which withdraws the notch from the end of 65, when the jaw 66 immediately closes on 67, the cord from the spool meanwhile having been placed between them.

The cord is now cut by the knife 73 being thrown against it by the rod 72, which is operated by the levers 74 76 77. The spiral

spring on the rod 62 constantly holds it down, except when acted upon to cut the cord.

When the block travels in the direction of the arrow to deliver the cord to the arm *p*, the device 65 64 70 returns to its original position by its own action.

The operation and construction of the stop 49, Fig. 9, which holds the cord in position under the center of the sheaf; the pinching-bar 57, which holds the crossed cord between 57 and 49, and the grooved wheel 62, which carries the cord to 62′, to be acted on by the knot-tying device, is as follows: On the shaft 59, Fig. 6, are placed the irregular arms 60 and 61. At the end of 61 is placed the grooved wheel 62. The levers 44 and 51× work on pivots and operate the vertical rods 46 and 53. The spiral springs on these rods constantly hold them up when not acted on by the levers. The bar 46 operates the bar 49, Fig. 8, by means of the irregular parts riveted to the side of the bar. When the rod 46 is thrown down the bar 49 is thrown out across the opening in the platform of the binder, immediately under the center of the sheaf, about three-sixteenths of an inch wide. When it is thrown down the bar 48 passes into the notch 47, holding it there.

The pinching-bar 57 is operated by the rod 53, by means of the lever 56. When the rod 53 is thrown down the bar 57 is thrown out, and at the same time it is thrown up by the action of the inclined surfaces at 58. The bar 55 passes into the notch 54 when the rod 53 is thrown down. When these bars 55 and 48 are withdrawn from these notches the spiral springs return the rods 53 and 46, and consequently the bars 49 and 57, to their original positions.

After the block *m*, Fig. 7, has started on its movement in the direction of the arrow, the projecting part 43 strikes the lever 44 at the bent part 45 and forces it down. This throws out the bar 49. The irregular block 50 also passes off of the end of the arm 60, allowing the wheel 62 to return to the position seen at Fig. 6. This is done by means of a spring or counter-balance on the shaft 59.

On the return of the block *m* to the position seen at Fig. 7, the block 50 strikes the end of the lever 51, at 52, thus throwing down the rod 53. This operates the pinching-bar 57. The block 50 next strikes the arm 60, carrying the wheel 62 from 62 to 62′, Fig. 9, and the cord with it.

The mechanism which gives the motions to the knot-tying device, that which withdraws the bars 55 and 48 from the notches 54 and 47, and that which operates the cord-cutting device, is next explained:

At 32, Fig. 4, is seen the irregular groove in the sliding block *n*, in which plays the pin 33 of the reciprocating block 28, Fig. 3. On the lower side of the block *n*, at 41, is seen the irregular block which operates the bar 39 and vertical lever 38, Fig. 3. At 78 and 79, Figs. 2, 3, 4, are seen two vertical levers, working on a fulcrum in the center. These levers have two motions, one in the direction of their axes along the slot in which works the fulcrum pivot, the other in the direction of the arrows, Fig. 3. The lever 78 operates the bar 77, and cuts the cord, Fig. 7.

The lever 79 withdraws the bar 48 and 55 from the notches 47 54. To 48 is attached an arm, 80, which plays against a pin in 55, so that they both have a simultaneous motion out of the notch, yet 48 can enter the notch in 46 before 55 can enter that in 53.

When the block *n* commences its motion in the direction of the arrow, the head 40 passes along the inclined head of 41 to its inner edge, thus operating the lever 38 and throwing out the shaft 7 and sliding frame 4, Fig. 3. While this is being done the head 33 has traveled along the groove 34 to 35. In passing up 35 (or in 35) the block 28 rotates the tube 14 and completes the movement seen at 20, Fig. 10.

As the pin passes in the part of the groove 36 the block 28 is at rest, and the head of the lever 78 passes along the head of 41 to its inner edge, thus cutting the cord.

The arm *p* has now opened so far on the pin of the block *n*, which carries it, as to release the other end by dragging the cord out of the jaws which hold it. Thus both ends are loose, yet held by the arm 17 at 20, Fig. 10. The pin 33 now passes in the groove 37, which reverses the motion of the block 28 and completes the movement seen at 21, Fig. 10. The head 40 now passes off of the end of 41, thus releasing the sliding frame 4 and shaft 7, which spring back, thus completing the knot. The head of the lever 79 now passes along the head of 41 to its inner edge, thus withdrawing the bars 48 and 55, which releases the sheaf-band, and the completed sheaf is now thrown from the platform. On the return of the block *n* the block 41 throws down the levers 7× and 79, and passes over their ends, and pushes back the rod 39 against the spiral spring 42, which returns it when the block 41 has passed. The levers are returned by the spiral springs upon them.

I will now recapitulate the consecutive movements of this machine. Mention of the letters and numbers will suggest the figures.

The rake of the reaper first rakes the cut grain from the knives immediately back onto the platform of the binder, and between the sliding wings on each side. These wings now approach toward the center of the platform, carrying the grain with them to a width of, say, eighteen inches.

The arm *p* now rises through a slot in the platform, taking the cord from the block *m* as it does so, and passing it around the sheaf and beneath the platform on the other side. The hinged end is now taken by the pin attached to the block *n* and closed, compressing the sheaf, and crossing the band on the under side of the stop 49.

The block *m* now approaches, throwing down the lever 51 and pressing or pinching the crossed cords between 49 and 57.

The lever 60 is now depressed, carrying the cord to the position 62′, Fig. 9, and the arm *p* has opened, carrying the other end into 62′. Simultaneously with this movement the cord is placed in the jaws 66 and 67.

The cord is now taken by the arm 17 of the knot-tying device. The cord is then cut, and drawn from the arm *p* simultaneously.

The arm 17 then completes its movement, and the frame 4 is then thrown back, completing the knot. The stop 49 and the bar 57 are then withdrawn, thus releasing the band. The arm *p* is now returned to its position below the platform. The sheaf is now thrown from the platform, and simultaneously with that movement the block *m* is returned with the cord for the next sheaf.

What I claim as of my invention, and desire to secure by Letters Patent, is the following:

1. The sliding frame 4, acting in combination with the shaft 7, provided with the notch 8 and friction-wheel 9, arm 17, with the springs upon it, and the piece 16, to which it is attached; collar 24, with the groove 25, and pin 26, giving the longitudinal motion to the piece 16; tube 14, with the spiral thread 27 upon it, and the block 28, which gives the rotary motion to the tube, all constructed, arranged, and acting in the manner and for the purpose set forth.

2. The application to the sliding block *n* of the irregular groove 32, to operate the block 28, and of the irregular piece 41, to throw out the sliding frame 4, to operate the lever 78, which cuts the cord, and to operate the lever 79, which releases the sheaf-band, constructed in the manner and for the purpose set forth.

3. The device for releasing the sheaf-band, consisting of the lever 79, the two bars 48 and 55, and the arm 80, constructed in the manner and for the purpose set forth.

4. The mechanism for cutting the cord, consisting of the lever 78, the bar 77, the arms 76 and 74, the rod 72, and the knife 73, constructed for the purpose and in the manner set forth.

5. The sliding jaw 66, with its spiral spring 68, and the self-acting device 64, 65, 70, acting in combination, in the manner and for the purpose set forth.

6. The projection 43 and block 50, in combination with the levers 51, 44, 60, and 61, the wheel 62, the rods 53 and 46, the bars 49 and 57, and the lever 56, all constructed in the manner and for the purpose set forth.

7. The device for giving the longitudinal motion to the shaft *c*, consisting of the wheel *e*, with its segmental projections *t* and *u*, the coupling *w w* and *x*, and the wheel *v*, acting in the manner and for the purpose set forth.

8. The sectional gear *r*, with its projection *z*, the sliding rack *s*, the stop 1 1, with the spring 2, operating in combination, in the manner and for the purpose set forth.

9. The reciprocating bars *g g g g*, constantly traveling in parallel paths without lateral motion, the connecting-rods *h h h* and *o o o o*, the short arms *i i i*, and the long arms *k k k* on the vertical shafts *j j j*, all acting in combination, in the manner and for the purpose set forth.

I. LANCASTER.

Witnesses:
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FRANK W. PLUMMER.