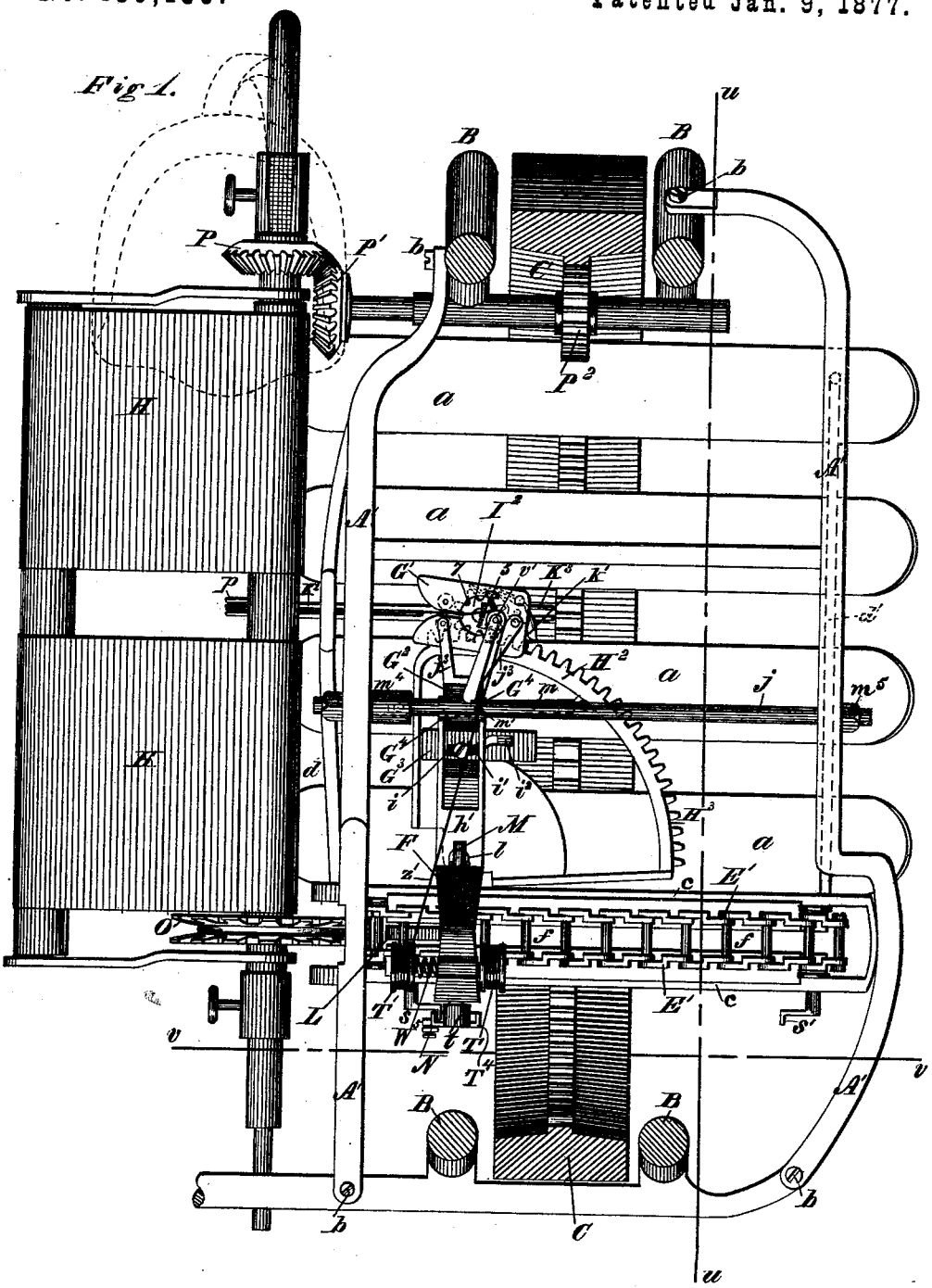
5 Sheets—Sheet 1.

C. B. WITHINGTON.

GRAIN-BINDER.

No. 186,186. Patented Jan. 9, 1877.

Fig 1.



WITNESSES

Harry King

B. H. Mould

Chas: B. Withington. INVENTOR

By his Attorney

Wm D. Baldwin

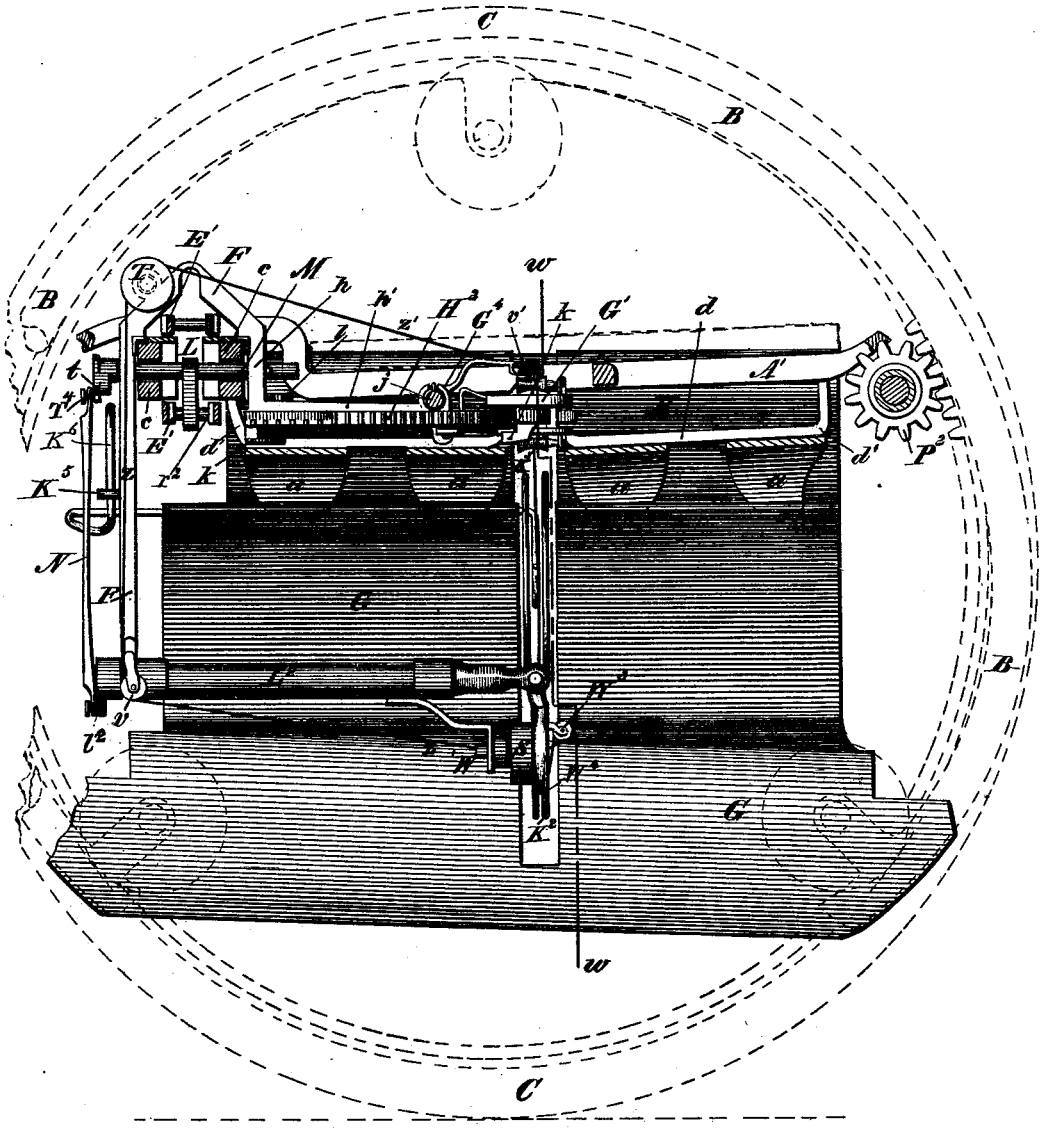
5 Sheets—Sheet 2.

C. B. WITHINGTON.

GRAIN-BINDER.

No. 186,186. Patented Jan. 9, 1877.

Fig. 2.



WITNESSES

Harry King

B. H. Mowed

Chas: B. Withington. INVENTOR

By his Attorney

Henry D. Baldwin

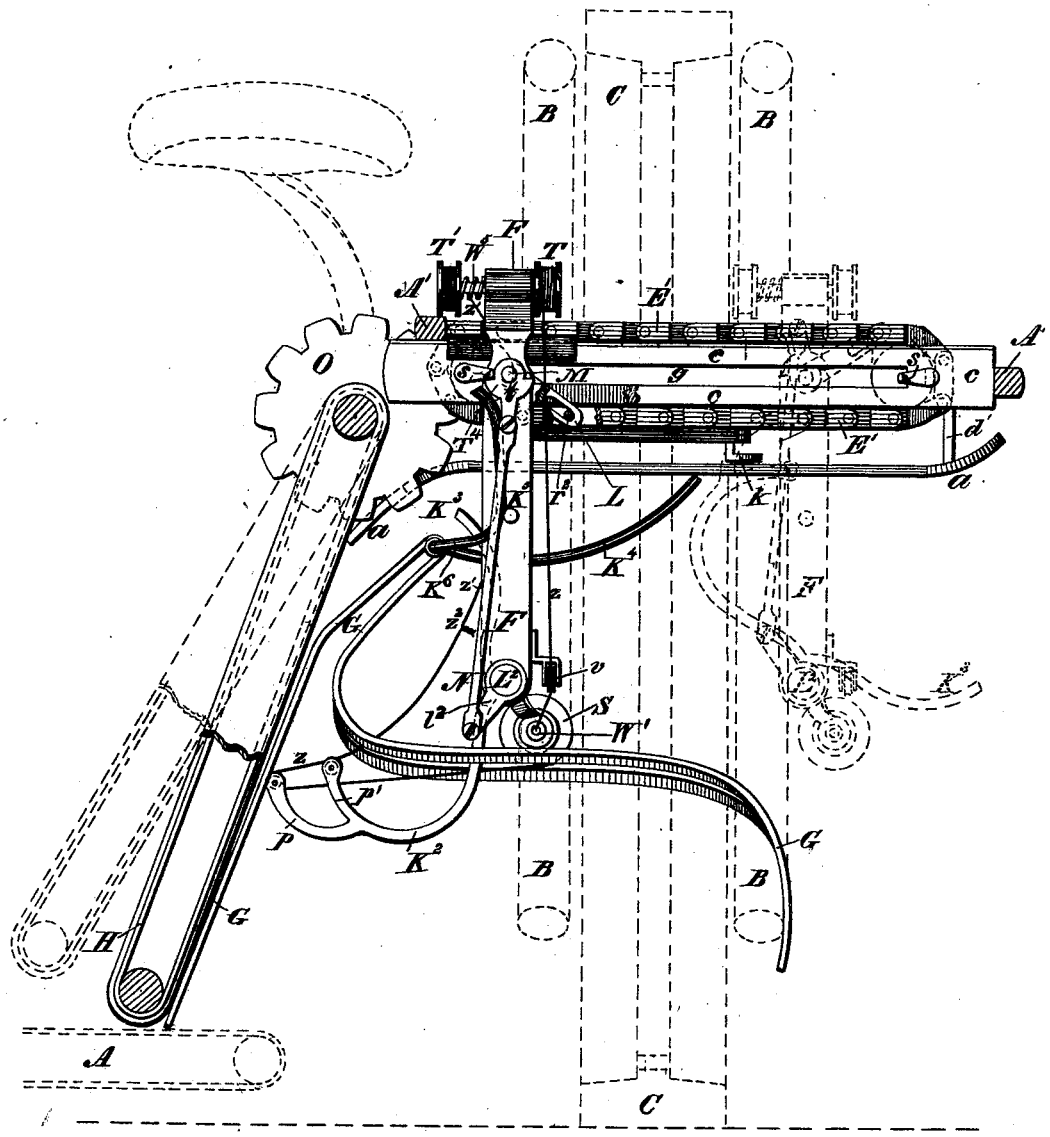
5 Sheets—Sheet 3.

C. B. WITHINGTON.

GRAIN-BINDER.

No. 186,186. Patented Jan. 9, 1877.

Fig. 3.



WITNESSES

Harry King

B. H. Mowell

Chas B. Withington. INVENTOR

By his Attorney

Wm D. Baldwin

5 Sheets—Sheet 4.

C. B. WITHINGTON.

GRAIN-BINDER.

No. 186,186. Patented Jan. 9, 1877.

Fig 4.

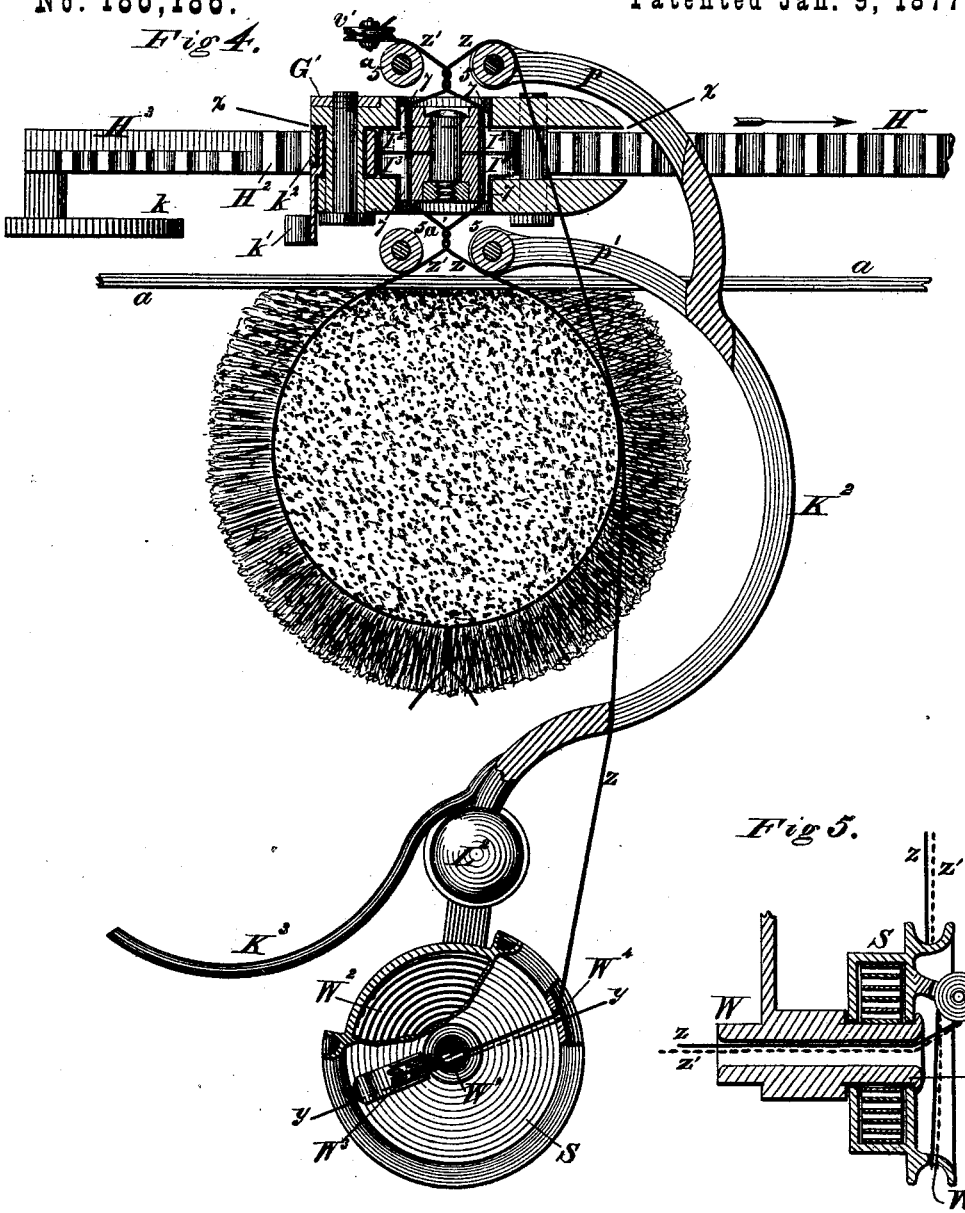


Fig 5.

WITNESSES.

Harry King

B. F. Morse

Chas B. Withington

INVENTOR

By his Attorney

Wm D. Baldwin

5 Sheets—Sheet 5.

C. B. WITHINGTON.

GRAIN-BINDER.

No. 186,186. Patented Jan. 9, 1877.

Fig 6.

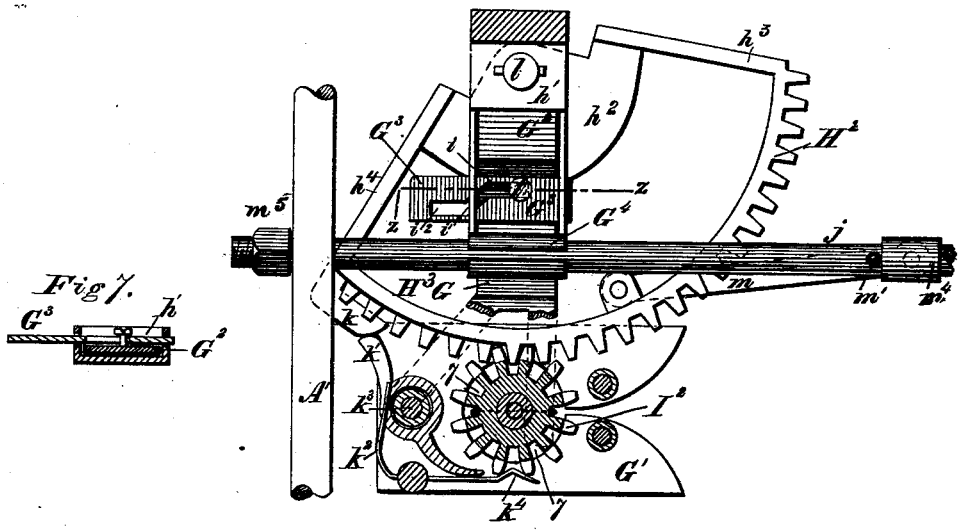
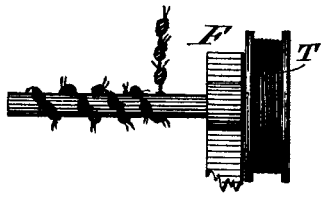


Fig 7.

Fig 8.



WITNESSES

Harry King

B. F. Morse

Chas. B. Withington.

By his Attorney

Wm D. Baldwin

INVENTOR

UNITED STATES PATENT OFFICE.

CHARLES B. WITHINGTON, OF JANESVILLE, WISCONSIN, ASSIGNOR TO C. H. AND L. J. McCORMICK, OF CHICAGO, ILLINOIS.

IMPROVEMENT IN GRAIN-BINDERS.

Specification forming part of Letters Patent No. **186,186**, dated January 9, 1877; application filed November 11, 1876.

To all whom it may concern:

Be it known that I, CHARLES B. WITHINGTON, formerly of Lewisburg, in the county of Union and State of Pennsylvania, but now residing at Janesville, in the county of Rock and State of Wisconsin, have invented certain new and useful Improvements in Grain-Binders for Harvesters, of which the following is a specification:

My present invention more especially relates to certain improvements on the grain-binding machine patented by me February 20, 1872, as No. 123,967, in which two binding-wires are employed, though some of my improvements are obviously applicable to machines differing in construction from that shown therein.

My improvements consist, first, in a binding-machine so organized as to move up to the cut grain lying in a suitable receptacle, grasp the gavel, move backward, binding the bundle as it retracts, and finally discharge it, whereby the traverse of the binder itself is caused to actuate the binding mechanism proper, the gavel while being bound is taken out of the way of the incoming grain, and the discharge of the bound gavel is facilitated; secondly, in combining a stationary grain-receptacle, a reciprocating carriage carrying the binding mechanism, and a binding or wire-carrying arm vibrating on said carriage, whereby the grain while being bound is carried away from the receptacle toward the place of discharge; thirdly, in combining, with the binding-carriage, a continuously-traversing endless chain, and a stirrup-lever pivoted on the chain and on the binding-frame, and having an intermittent semi-rotating movement at each end of its traverse, whereby the binding mechanism is reciprocated; fourthly, in combining a continuously-traversing endless chain, a stirrup-link carried thereby, and having an intermittent semi-rotative movement at each end of the traverse of the chain, a rotating crank-shaft, actuated by the stirrup-lever, a pitman connecting said crank-shaft with a rock-shaft having a crank of longer radius than the crank of the crank-shaft, and a binding-arm mounted upon said rock-shaft, whereby the binding-arm is vibrated at suitable intervals; fifthly, in combining a reciprocating binding-carriage, a rotating crank-shaft, vibrating the binding-arm through link-connections, a guide-cam on the crank-shaft, and fixed stops on the frame, whereby the binding mechanism is positively locked at each end of its movement until the binding-arm is properly opened and closed; sixthly, in combining a binding-carriage, a continuously-traversing endless chain, a stirrup-link, pivoted on the chain, having a semi-rotative movement at each end of the traverse of the chain, a crank-shaft mounted upon the binding-carriage, rotated by the link, and vibrating the binding-arm through suitable link-connections, and a binder-head or twister-wheel, also carried by the binding-carriage, whereby the harmonious co-operation of the reciprocating, vibrating, and twisting mechanism is secured; seventhly, in combining with a reciprocating carriage a binding-head, or wire twisting and cutting mechanism, actuated intermittently at proper intervals by a sector-rack pivoted upon said reciprocating frame, and driven by its reciprocations; eighthly, in combing a reciprocating binding-carriage, wire cutting and twisting mechanism carried thereby, a vibrating sector-rack pivoted thereon, and mechanism which automatically throws the wire cutting and twisting mechanisms into or out of gear at the proper moment during the reciprocation of the binding-carriage; ninthly, in combining a reciprocating binding-carriage carrying wire cutting and twisting mechanism, a vibrating sector-rack mounted upon the carriage and actuating said wire cutting and twisting mechanism, and a pitman pivoted to the rack, and sliding upon a fixed portoin of the frame, and controlled by an adjustable stop, whereby the operations of the binding-head may be correctly timed or adjusted in accordance with requirements of the work to be done; tenthly, in combining a wire twister and cutter composed of two sections or gears turning independently on a common axis, a pawl pivoted upon the binding-head and acting upon one section, and a spring-detent acting upon both sections, whereby one section can be held stationary while the other is cutting, and the coincidence of the teeth be se-

cured for the proper entrance of the binding-wire; eleventhly, in combining with the sectional wire twisting and cutting pinion, its pawl, and spring-detent, a vibrating sector-rack, having on a portion of its periphery a full set of teeth to act on both sections, and on another a partial set to act on one section only, and a cam to act on the pawl, whereby one part of the pinion is held stationary while the other is moved to cut the wire; twelfthly, in combining with a reciprocating carriage a vibrating sector-rack, and a binding-head mounted on a sliding frame controlled by an eccentric slot and pin, whereby the twisting-pinion is automatically thrown into and out of gear at proper intervals, to regulate the placing, twisting, and cutting of the wires; thirteenthly, in combining a reciprocating binder with a compressor vibrating on a fixed portion of the frame, whereby the gavel is compressed by the action of the carriage upon the compressor as it moves up to grasp the gavel.

The accompanying drawings represent one convenient mode of carrying out the objects of my invention, in combination with an annular drive-wheel, through which the grain passes, which device constitutes the subject-matter of Letters Patent No. 150,992, dated May 19, 1874, the application of which was filed simultaneously with one of which this present one constitutes a division, and, as the details of construction shown in said patent constitute no part of the subject-matter herein claimed, a specific description of them herein is deemed unnecessary.

Figure 1 is a plan or top view of so much of the mechanism as is necessary to illustrate the construction and operation of my improved apparatus, with the driving-wheel and portions of the frame in horizontal section. Fig. 2 represents a vertical section on the line *u u* of Fig. 1; Fig. 3, a similar section on the line *v v* of Fig. 1. Fig. 4 represents a transverse vertical section on the line *u u*, Fig. 2. Fig. 5 represents a section, through the rotary take-up tension, on the line *y y* of Fig. 4. Fig. 6 is a bottom plan view, partly in section, of the cutting and twisting mechanism and its actuating sector-rack. Fig. 7 is a transverse section therethrough on the line *z z* of Fig. 6, and Fig. 8 represents a modification of the wire-supplying device, showing means whereby the wire may be supplied to my double twisting apparatus from a single reel.

In the drawings a suitable main frame, B, is shown as mounted within, and supported by, an annular drive-wheel, C. An endless apron, A, of the usual construction, upon which the cut grain falls, is connected with the main frame in well-known ways, and conveys grain to and underneath a pendulous endless apron, H, of well-known construction, suspended from a revolving shaft driven by suitable gearing in such manner that the lower end of the endless apron and its supporting-frame and roller is free to swing around its driving-shaft. The apron may be made in two parallel strips with a central space between them opposite the slot in the grain-board, through which the head of the binding-arm works when entering the grain. An inclined grain-board, G, secured upon the platform, extends downward, so that its lower end comes nearly in contact with the endless apron A. The elevating-apron H rests on this board, and the grain enters between them and is carried up by the apron. The grain-board is slotted centrally and longitudinally for the passage of the binder-arm. From its highest point the grain-board is first curved inward and downward, so as to form a concave receptacle for the incoming grain, and is then projected horizontally through the drive-wheel, where it is curved downward to facilitate the discharge of the bound gavel.

The construction of parts above described is not, however, claimed herein, except in combination with a binder, as they constitute a portion of the subject-matter claimed in my patent of May 19, 1874, above mentioned. The binding-machine is constructed with a frame, A′, provided with slats *a*, constituting an open slatted bottom. The ends of these slats next the elevating-apron are bent down, so as to extend over the inclined grain-board G and abut against the elevating-apron, to aid in deflecting the grain into the receptacle. The opposite ends of the slats are curved upward out of the way, and to act as a shield for the mechanism. The grain, it will be remembered, in this instance passes under these slats, which are suspended beneath the mechanism by studs *d′*.

The binding mechanism proper is mounted upon a carriage, F, reciprocating on a guideway, *c*, secured upon the frame, and having a vertical slot, *f*, and a horizontal slot, *g*, extending nearly throughout its whole length, and intersecting each other, so as to form an unobstructed space. A double sprocket-wheel, O, on the shaft of the elevating-apron, driven by suitable gears P P^1 P^2, drives an endless chain, E′, composed of wide links, traversing in the vertical slot of the guide-frame *c* above mentioned. These links, it will be observed, are made wide, and run at each end around pulleys arranged in pairs at each end of the guideway, on independent stud-shafts secured therein, so as to leave an unobstructed space between them, for a purpose hereinafter described.

A slotted link or rotary stirrup-lever, L, is pivoted at one end to one of the links r^2 of the endless chain, while its other end is rigidly secured to a crank-shaft, M, adapted to slide in the horizontal slot *g* of the guideway *c*. This crank-shaft, it will be observed, always travels between the upper and lower sides of the endless chain, while the slotted end of the link travels with the chain, and will consequently move horizontally in one direction, pass up between the pulleys at the

ends of the guideway, return backward on the opposite side of the guideway, and again descend, thus alternately making a half-revolution at each end of its traverse.

The binding-arm K^2 vibrates with a rock-shaft, L^2, mounted upon a standard, F, secured upon the traversing binding-carriage. A crank, *t*, on the crank-shaft M, is connected, by a pitman, N, with a crank of the rock-shaft L^2, above mentioned. The crank *t*, of course, revolves with its crank-shaft, but, being shorter than the crank l^2, the shaft L^2 is only rocked or vibrated, instead of being revolved, as it would be were the cranks of equal radius.

A guide-slot is formed concentrically with the crank-shaft in an enlarged hub or shell, T^4, which guide-slot at proper intervals passes over stop-pins *s* on the ends of the guide-frame at the moment when the link is turning around its guide-pulleys with the chain. The binding-carriage is consequently held positively locked at this moment while the crank-shaft is rotating, which is an important feature, as at these moments the binding-arm is either opening or closing, and the relative position of the parts is such that but for this locking mechanism there might be a tendency of the binding-carriage to traverse, which would impede the effectiveness of the operating mechanism.

It will be readily understood from the foregoing description that the continuous travel of the endless chain in one direction will alternately reciprocate the binding-carriage from one end of its guideway to the other, and at each end a momentary pause in the reciprocation will take place, while the stirrup-link is making its half-turn and reversing its position.

Two positions assumed by the parts are shown respectively by the full and dotted lines in Fig. 3, where the full lines show the binding-arm as just beginning to rise to grasp and move backward with the bundle, while the dotted lines show its position after discharging the gavel, when about to open to move forward again to grasp a new bundle.

The binding-head G^1 and its sectional twister or twisting pinion, made of two parts, I^2 I^3, is substantially the same in construction and operation as that shown and described in my aforesaid patent of February 20, 1872, except in a few details of construction shown in the drawing, presently to be indicated.

This binding-head I now attach to a plate, G^2, capable of sliding longitudinally in a guide-extension, h^1, mounted on the traversing binding-carriage. A plate, G^3, provided with an angular guide-slot, i i^1 i^2, slides transversely across the guide-extension h^1. A guide-pin on the longitudinal slide G^2 works in a slot of the transverse guide G^3.

The binding-head and its attachments are supported by means of an open guide-sleeve, G^4, forming part of the guide-extension h^1, and the binding-head is braced by diagonal stays j^3 connecting this sleeve and head.

The sectional twister or twisting-pinions are operated at suitable intervals by means of a sector-rack, H^2, vibrating on a fulcrum, *l*, on the binding-carriage, and these pinions are automatically thrown into and out of gear by the eccentric slide above described. The sector-rack has its teeth partly cut away on one side of a longitudinal central line, as shown at H^3, Figs. 4 and 6, so that at the moment of severing the wire the sector-rack will gear only with one of the twister-pinions, while it gears with both pinions at the time when one of the wires is being carried around out of the way of the wire which is carried into the slit of the binding-head by the wire-carrying arm, and also when the wire is being twisted upon the bundle and above the binding-head, in order to insure the connection of the ends of the wire after the wire upon the bundle is cut off. One of the cutter-pinions is held positively still, when desired, (while the other is free to rotate,) by means of a pawl, K^2, vibrating on a pivot, K^3, on the cutter-head.

A toe or wiper, *k*, on the sector-rack at proper intervals strikes the end of the lever K^1 of the pawl, to throw it into contact with the teeth of one of the pinions.

In Fig. 6 the spring k^2 is shown as made wide enough to interlock with both of the cutter-pinions and having an angular bend or depression, k^4, which serves to hold both cutter-pinions in position for the reception of the wire when the pawl is thrown out of gear. When the pawl is in gear one pinion is locked while the other is turned by the sector-rack, thus severing the wire.

The sector-rack is vibrated at proper intervals by means of a pitman, *m*, pivoted thereto at one end, while the other end is pivoted to a sleeve, m^4, sliding on an auxiliary guide-rod, *j*, which slide, at the proper moment, abuts against a stop-pin, m^1, on the rod. This pin may be adjusted back and forth with nicety by means of nuts and screws on the ends of the guide-rod, as at m^5, Fig. 6. The extent of the movement of the sleeve in an opposite direction may be controlled by abutting against the rail of the binding-frame, or by a stop adjusted in accordance with the distance traversed by the binding mechanism.

That portion of the sector nearest its fulcrum is depressed below the plane of the teeth, in order that it may work under the guide-piece h^1 of the carriage, while the sector-arms h^3 h^4 are elevated above the depressed plate h^2 which connects their inner ends, by which means the arms of the sector, as they vibrate alternately, strike the transversely-sliding slotted plate G^3, thus throwing the twisting-pinion into and out of gear at proper intervals. The grain deposited in the receptacle is compressed by means of retaining-fingers K^3 fixed upon the rock-shaft L^2. A vibrating compressor, K^4, pivoted at the high-

est point of the grain-board G, or other convenient part of the harvester, may be used. This compressor ordinarily hangs nearly vertical, conforming with the curvature of the grain-receptacle; but, as the binding-arm advances to grasp the bundle, a trip-pin, K^5, on the arm F, strikes an arm, K^6, on the compressor-shaft, and throws the compressor up into the position shown in Fig. 3.

The wire-carrying arm K^2 is mounted on the inner end of the rock-shaft L^2, (see Fig. 2,) its outer extremity being bifurcated, so as to form two prongs, *p p'*, carrying friction-pulleys on their ends. When the binding-arm is closed to carry the wire into the twister, one of these prongs comes on each side of the twisting-head, as shown in Fig. 4.

In the drawings the wire is shown as supplied from two reels, T T'. The wire z^1 from the reel T' passes over a pulley, *v'*, and a roller, 5, directly to the binding-head, while the wire *z* from the reel T passes downward over a pulley, *v*, on the binding-carriage F, to the wire-carrying arm K^2.

In order to preserve the proper tension on the binding-wire I pass it through and around a tension-drum, S, arranged at a point intermediate between the wire-reel and the grain-binding head.

In Figs. 4 and 5 this drum is shown as mounted on an arm projecting from the rock-shaft L^2, and forming an extension of the binding-arm. The drum rotates upon a hollow arbor, W^1, between which and the drum is a coiled spring, W^2, secured at one end to the hollow axis, and at the other to the drum. The wire passes through the hollow arbor, around the guide-roller w^3, and through a slot in the drum, being then wound one or more times around the periphery of said drum.

In Fig. 5 both wires are shown as thus carried through the tension-drum, one in full and the other in dotted lines. The reels T T^1 are so constructed that one revolves with the shaft, while the other is acted upon by a spring, W^5, Fig. 3, by which mode of construction one intermediate tension is made available for controlling the wire from both reels, while either may be operated separately when required. The wire *z* leading from the reel T is shown in Fig. 2 as carried around the pulley *v*, through the hollow arbor of the tension-drum S, around the guide-pulley W^3, through the hole W^4 in the flange of the drum, and around the grooved periphery of the drum, around which the wire is wound spirally as often as the coils of the spring within the drum will permit, or as may be required in taking up the slack necessary to produce the required tension on the wire. The wire is carried from the drum over the pulley 5 of the upper fork *p* of the wire-carrying arm, and is united with the wire z^1, which passes from the reel T^1 around the pulley r^1, Fig. 2; thence over a friction-pulley through the slot of the binding-head, where it is united to the other wire, *z*, by twisting the ends together below the binding-head, as at z^2, Fig. 3. The subsequent twisting operations are performed automatically.

As the gavels are bound, wire is drawn from both reels T T', and, as both are connected with the same shaft, the wire paid out from the reel T will be regulated by the movement of the reel T', which is intermittently driven by the strain upon the wire by the wire-carrying arm. The wires pass over pulleys 5^a $5^{a'}$ above and below the binding-head, as well as over the rollers 5 5 on the binding-arm.

Instead of having only one wire pass through the tension-drum, both wires may be thus passed through, and when this is done, as shown in Fig. 5, the tension upon both wires will be equal, and they will consequently pay out uniformly from both reels.

As a modification of the mode of operating my invention, both as heretofore patented and as herein shown, I propose to take off the reel T and use the end of the shaft as a windlass, in the following manner: To thread the machine, carry the wire down through the tension-drum, up over the wire-carrying arm into the binding-head, thence by the pulley *v'*, and fasten its end to the windlass end of the reel-shaft. Now, when the machine operates continuously for binding gavels, the wire will be paid out from one reel only, and the two twists will be made on the wire, but the bundles, when bound and cut off, will have but one twist on the wire which binds them. The upper twists or knots of the wire will be wound upon the windlass, as illustrated in Fig. 8 of the drawings. This plan will involve a slight loss of material, and even may be found very objectionable, as compared with my double-wire binding operation; but as it will produce the same result, of automatically reconnecting the severed ends of the wire above the binding-head, and also twists the wire upon the bundle, I have described it here for my protection.

I do not claim herein the tension-drum, as that is shown in an application for Letters Patent filed by me January 25, 1870; neither do I claim the combination of a binding-head, a wire-reel, and an intermediate take-up, as this combination is claimed in an application filed by me March 5, 1874, of which this is a division.

The operation of my improved binding mechanism is as follows: The wires being threaded, as above described, and their ends united, as shown at z^2, Fig. 3, the machine is started. The cut grain falls upon the endless apron A, whence it is carried by the elevating-apron H over the grain-board G, into the receptacle. As the binding-arm moves forward from the position shown in dotted lines in Fig. 3 to that shown by the full lines in said figure, its forked end opens and passes through the slot in the grain-board, and moves forward under the grain in the receptacle. As the

binding-arm passes underneath the grain-board, the retaining-arms K^3 are turned up and sweep the grain before them into the receptacle. At the same time the pin K^5 on the arm F strikes the lever of the compressor K^4, and throws it up, compressing the bundle between it and the bottom slats *a*. At the same time the binding-arm K^2 rises up through slots in the grain-board and in the endless apron, carrying the wire around the bundle and pressing it into the jaws of the binding-head, as shown in Fig. 4. Previous to this, however, a half-turn had been given to the twister by reason of the forward movement of the binder-frame, which caused the transverse slide G^3 to abut against one of the arms of the sector-slide, and thus throw the twister into gear with the sector-rack. This movement brought the wire already lying in the jaws of the twister around on the opposite side of the pinion, as shown in Fig. 6, so that when the other wire is brought up into the position shown in Fig. 4, and before the two wires are twisted together, they lie in the spaces between the teeth of the twister-pinions and on opposite sides thereof. The twister-pinions being thus in gear, the backward movement of the binding-carriage twists the wires together, as shown in Fig. 4. As soon as this is done, the pinions pass over that portion of the rack which has the partial teeth H^3 thereon. The wiper *k* on the rack then strikes the lever k^1 and forces the pawl into contact with the teeth of the free pinion, thus stopping its rotation, while the other pinion continues to turn, thus severing the wire. As soon as this is done, the transverse slide G abuts against the sector-arm and throws the twister-wheel out of gear. The gavel drops upon the ground as soon as the wire is severed, and the operations above described are repeated.

As the binding-arm opens, wire is paid out from the reel, and as the arm passes around the compressed bundle the slack wire is taken up by the backward rotation of the tension-drum, which thus preserves at all times a uniform tension upon the wire.

It will be noticed that in the machine shown in the drawings the binding-arm is suspended below the binding-carriage. It may be worked with equally good effect, however, above the carriage, and such reversal of the position of the binding-arm requires very little change of the organization of the binding mechanism itself, and it has, in fact, been so used by me in several harvests.

I claim as my invention—

1. The combination, substantially as hereinbefore set forth, of a stationary grain-receptacle, a carriage reciprocating upon ways, and a binding or wire-carrying arm mounted upon said carriage, whereby the binding-arm moves up to the grain in the receptacle, encircles it with wire, removes it from the receptacle, and releases it after being bound.

2. The combination, substantially as hereinbefore set forth, of a stationary grain-receptacle, a reciprocating carriage, and a binding or wire carrying arm, and binding-head or twisting mechanism, mounted upon, and actuated by, the movements of said carriage.

3. The combination, substantially as hereinbefore set forth, of a reciprocating binding-carriage, a continuously-traversing endless chain, and a stirrup-lever, connecting the chain with the binding-arm, and having an intermittent semi-rotative movement at each end of its traverse, to reciprocate the binding mechanism.

4. The combination, substantially as hereinbefore set forth, of a continuously-traversing endless chain, a stirrup-link carried thereby, having an intermittent semi-rotative movement at each end of the traverse of the chain, a rotating crank-shaft actuated by the stirrup-lever, a pitman connecting said crank-shaft with a rock-shaft having a crank of longer radius than the crank of the crank-shaft, and a binding-arm mounted upon said rock-shaft, to vibrate the binding-arm at suitable intervals.

5. The combination, substantially as hereinbefore set forth, of a reciprocating binding-carriage, a rotating crank-shaft, a binding-arm vibrated, through link-connections, by the crank-shaft, a guide-cam on the crank-shaft, and fixed stops on the frame, to lock the binding mechanism at each end of its movement while the binding-arm is opening and closing.

6. The combination, substantially as hereinbefore set forth, of the binding-carriage, a continuously-traversing endless chain, a stirrup-link pivoted thereon, having a semi-rotative movement at each end of the traverse of the chain, a crank-shaft mounted upon the binding-carriage rotated by the link, a binding-arm vibrated from the crank-shaft through suitable link-connections, and a binding-head or twister-wheel mounted on the binding-carriage, for the purpose specified.

7. The combination, substantially as herebefore set forth, of a reciprocating carriage, a binding-head or wire twisting and cutting mechanism, and sector-rack, operating said mechanism intermittently by the motion of the binding-carriage.

8. The combination, substantially as hereinbefore set forth, of a reciprocating binding-carriage, wire cutting and twisting mechanism carried thereby, a vibrating sector-rack pivoted thereon, and mechanism, substantially such as described, which automatically throws the wire cutting and twisting mechanism out of gear, for the purpose set forth.

9. The combination, substantially as hereinbefore set forth, of a reciprocating binding-carriage carrying wire cutting and twisting mechanism, a vibrating sector-rack mounted upon the carriage and actuating said cutting and twisting mechanism, and a pitman pivoted to the rack, sliding upon a fixed portion of the

frame, and controlled by an adjustable stop, whereby the operation of the binding-head may be correctly timed.

10. The combination, substantially as hereinbefore set forth, of a sectional twister and cutter, consisting of two independently-revolving concentric pinions, a pawl pivoted upon the binding-head and acting upon one pinion, and a spring-detent acting upon both pinions, whereby one pinion can be held stationary while the other is cutting and the coincidence of the teeth of both pinions is secured for the proper entrance of the binding-wire before being cut or twisted.

11. The combination, substantially as hereinbefore set forth, of the sectional wire twister and cutter, consisting of two independently-revolving concentric pinions, its spring-detent and pawl, a vibrating sector-rack, having on one portion of its periphery a full set of teeth to act on both pinions, and on another a partial set to act on one pinion only, and a cam to act on the pawl, whereby one pinion is held fast while the other is moving to sever the wire.

12. The combination, substantially as hereinbefore set forth, of a reciprocating carriage, a vibrating sector-rack, and a binding-head mounted on a sliding frame, controlled by an eccentric slot and pin, whereby the twisting-pinion is automatically thrown into and out of gear at proper intervals, to regulate the placing, twisting, and cutting of the wire.

13. The combination, substantially as hereinbefore set forth, of a reciprocating binder with a compressor vibrating on a fixed portion of the frame, but actuated by the movement of the binder, whereby the gavel is compressed by the action of the binding carriage upon the compressor as it moves up to grasp the gavel.

In testimony whereof I have hereunto subscribed my name.

CHAS. B. WITHINGTON.

Witnesses:

HENRY T. EARNEST,

WM. J. PEYTON.