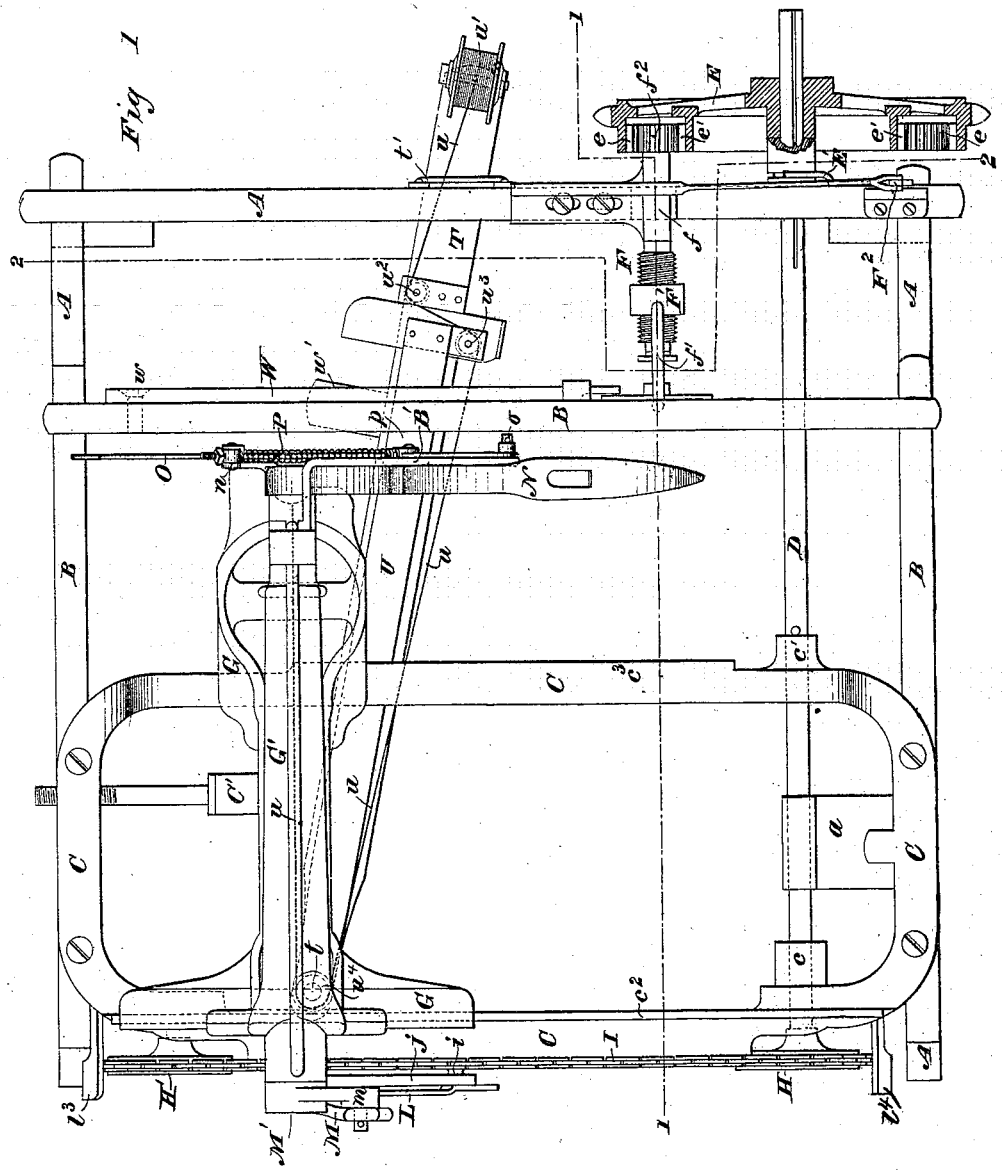
6 Sheets—Sheet 1.

W. R. BAKER.

GRAIN-BINDER.

No. 191,096. Patented May 22, 1877.

Fig 1



WITNESSES

Wm A Stinkle

A Stich

INVENTOR

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By his Attorneys,

Baldwin Hopkins & Peyton

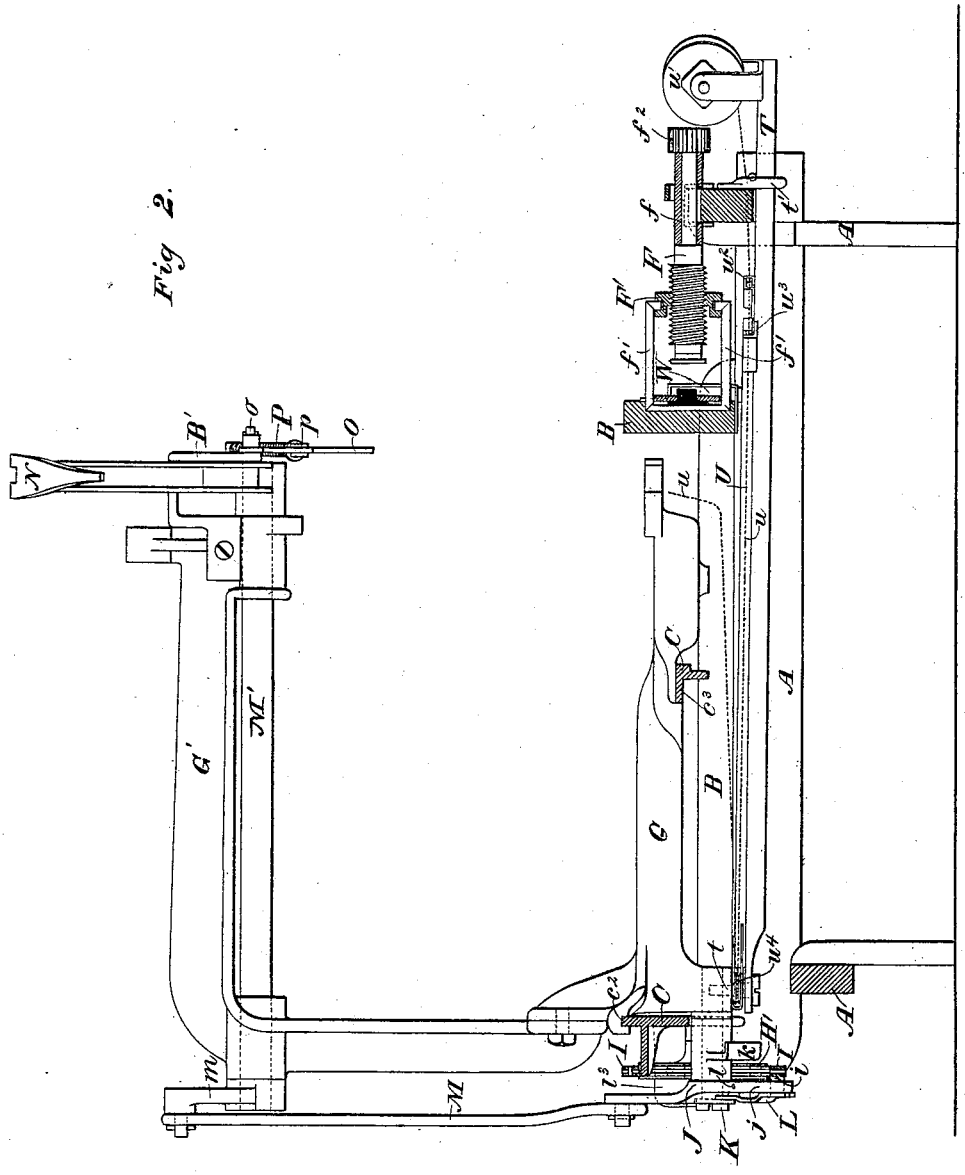
6 Sheets—Sheet 2

W. R. BAKER.

GRAIN-BINDER.

No. 191,096. Patented May 22, 1877.

Fig. 2.



WITNESSES

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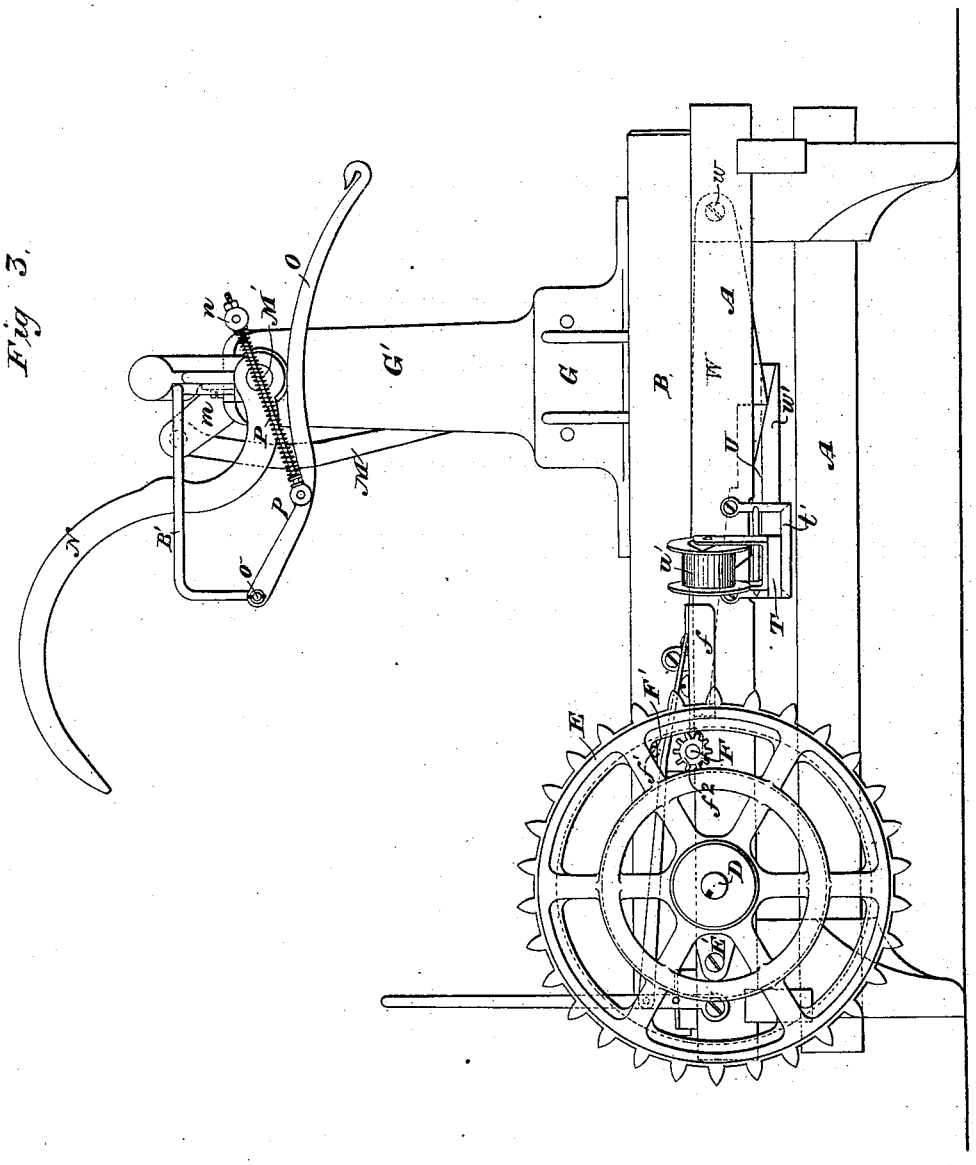
6 Sheets—Sheet 3.

W. R. BAKER.

GRAIN-BINDER.

No. 191,096. Patented May 22, 1877.

Fig 3.



WITNESSES

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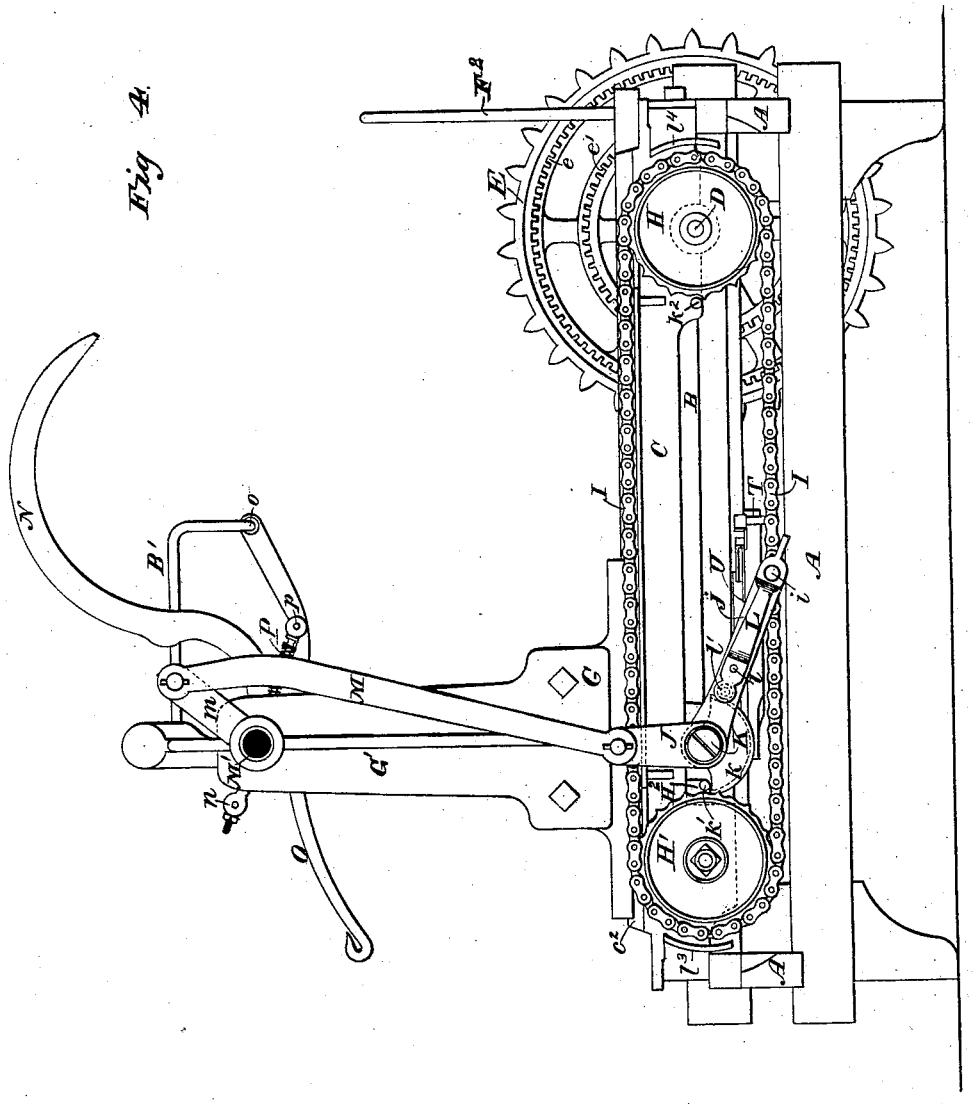
6 Sheets—Sheet 4.

W. R. BAKER.

GRAIN-BINDER.

No. 191,096. Patented May 22, 1877.

Fig 4.



WITNESSES

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6 Sheets—Sheet 5.

W. R. BAKER.

GRAIN-BINDER.

No. 191,096. Patented May 22, 1877.

Fig. 5

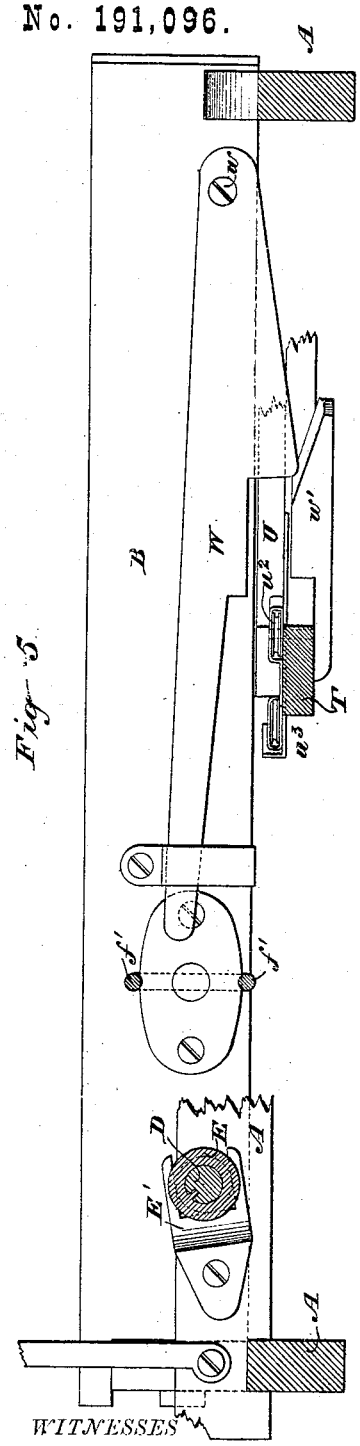


Fig 7

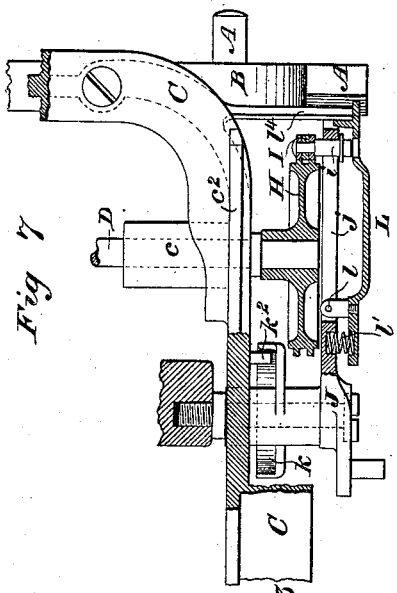
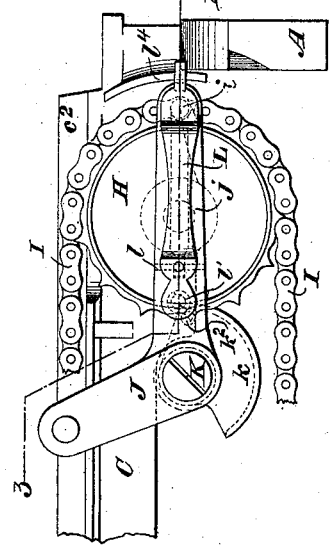


Fig 6.



WITNESSES

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6 Sheets—Sheet 6.

W. R. BAKER.

GRAIN-BINDER.

No. 191,096. Patented May 22, 1877.

Fig 10.

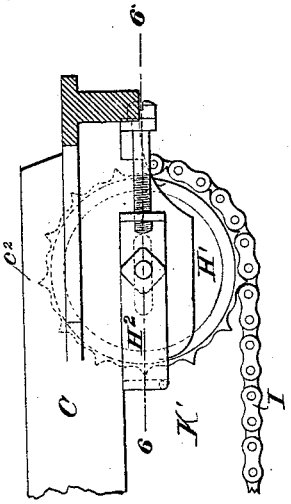

Fig 11.

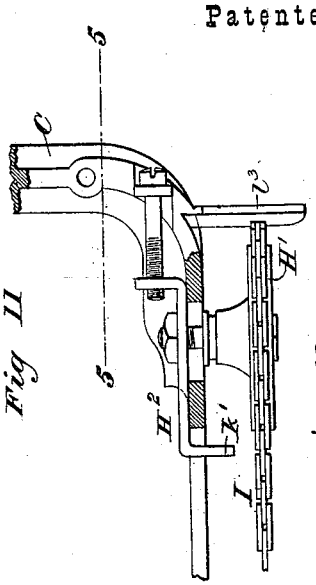

Fig 12.

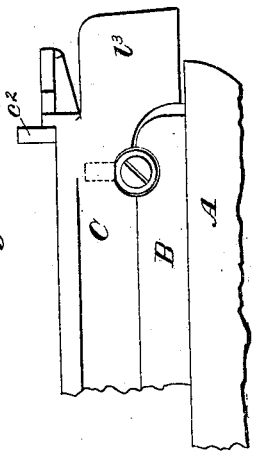

Fig 9.

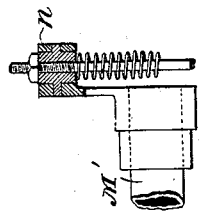

Fig 8.

WITNESSES

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F. Stick

INVENTOR

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UNITED STATES PATENT OFFICE.

WILLIAM R. BAKER, OF CHICAGO, ILLINOIS, ASSIGNOR TO C. H. & L. J. McCORMICK, OF SAME PLACE.

IMPROVEMENT IN GRAIN-BINDERS.

Specification forming part of Letters Patent No. **191,096**, dated May 22, 1877; application filed January 31, 1877.

To all whom it may concern:

Be it known that I, WILLIAM R. BAKER, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Grain-Binders, of which the following is a specification:

My invention more especially relates to that class of binding mechanism having a reciprocating binding-carriage and employing two wires, as in the well-known Withington binder, manufactured by C. H. & L. J. McCormick, of Chicago, aforesaid. One form of said Withington's binder is shown in Letters Patent No. 174,454, granted to him March 7, 1876.

The binding mechanism shown in that patent is capable of adjustment by hand relatively to the length of the grain, so as always to bind it near its middle.

The first part of my invention relates to a method of effecting this adjustment automatically; to which end my improvement consists in combining with an adjustable binder-frame a hinged yoke, in which works a screw-shaft mounted in sliding bearings, and carrying a spur-gear capable of being thrown into engagement alternately with either an internal or external spur-gear, or of being held out of gear with either, and as these gears are constantly rotating in one direction the rotation of the shaft adjusts the binding mechanism in one or the other direction.

I do not broadly claim, however, automatically adjusting the binding mechanism relatively to the length of the grain by the power of the machine, or by an adjustable connection or clutch between the binding mechanism and a constantly-moving portion of the gearing of the machine, but limit myself, substantially, to the combination of mechanism herein shown for attaining this result.

The next part of my invention relates to the mechanism for traversing the binding-carriage. Its objects are to simplify the construction and increase the efficiency of the apparatus shown in the Withington patent above mentioned; to which end my improvement consists in combining a single sprocket-wheel, a single adjusting sprocket-pulley, a single chain running over said wheel and pulley, a slotted intermittently-rotating crank, mounted on a stud-axle projecting from the binding-carriage and connected with said chain, a wire-carrying arm, and a pitman, connecting the intermittently-rotating crank and wire-carrying arm, whereby the binding-carriage is reciprocated and the binding-arm vibrated at suitable intervals.

The object of the next part of my invention is to prevent the binding-carriage from running ahead of the driving-pin on the traversing-chain when working on an inclined surface; to which end my improvement consists in combining with an intermittently-rotating crank a spring-latch, which locks the crank relatively to the traversing chain, with releasing stops or wipers at each end of the frame, whereby the crank is released at the proper moments to allow it to vibrate the binding-arm.

The next part of my invention relates to the compression of the gavel. Its object is to actuate the compressor directly from the binding-arm, but with an elastic pressure, to accommodate gavels of different size; to which end my improvements consist in combining a vibrating binding-arm, a vibrating compressor, pivoted eccentrically thereto, and an intermediate spring-rod, connecting the compressor directly with the extension or heel of the binding-arm, whereby the compressor is actuated by the oscillations of the binding-arm.

The object of the next part of my invention is to prevent shock or jar in stopping the binding-carriage on its backward movement, which end I attain by interposing a buffer or spring-stop between the traversing binder-carriage and the fixed frame.

The next part of my invention relates to the delivery of the lower wire. Its object is to deliver a certain quantity of wire from the under spool each time a sheaf is bound, so that the knot will always come above the twister, which end I attain by combining a connecting-wire, held under uniform yielding tension, with a supplementary feed mechanism, hereinafter more fully described, acting on said wire between the spool and twister, whereby, during the operation of binding, a fixed quantity of this wire is fed from its spool, held until the bundle is secured, and then released to permit the knot connecting the two wires to move out of the way of the twister.

My improvement further consists in com-

bining a traversing binding-carriage, a radius-bar pivoted thereto, carrying the wire-spool; a supplementary radius-bar swinging around a common pivot with the other radius-bar; pulleys on the respective bars, around which the wire passes; a latch acting on the supplementary radius-bar, and a stop carried by one of the bars to act on the latch to give an intermittent positive movement to the mechanism for feeding the lower wire.

In the accompanying drawings, which show so much of a binding-machine illustrating my improvements as is necessary to illustrate the subject-matter herein claimed, Figure 1 represents a plan or top view, with the platform removed to show the gearing. Fig. 2 represents a side view thereof, partly in section on the line 1 1 of Fig. 1; Fig. 3, a front view thereof; and Fig. 4, a back view thereof, the apparatus being shown in all these figures as in the attitude it assumes just before starting forward to gather a new bundle, with the binding-arm elevated. Fig. 5 represents a vertical transverse section on the line 2 2 of Fig. 1, showing the latching devices of the lower wire-feed. Fig. 6 is a detail view of the slotted crank and its latch mechanism. Fig. 7 is a horizontal transverse section therethrough on the line 3 3 of Fig. 6; Fig. 8, a front view of the binding and compressing arms; Fig. 9, a detail view therethrough on the line 4 4 of Fig. 8; Fig. 10, a detail view of the method of adjusting the tension of the traversing chain, partly in section on the line 5 5 of Fig. 11; and Fig. 11, a bottom-plan view of the parts shown in Fig. 10, partly in section on the line 6 6 of that figure. Fig. 12 represents a detail view of one of the unlocking-wipers and the screw for adjusting the tension of the driving-chain.

The binding mechanism is, by preference, mounted upon a suitable frame, A, secured upon or removably connected with the frame of a harvester of any usual well-known construction.

An adjustable frame, B C, rests upon the fixed frame A, and is movable thereon, the portion C being, preferably, made of metal, and provided with journals or pipe-box bearings c c^1, in which a long shaft, D, turns, as well as in bearings in the adjustable frame A, the frame being free to move endwise upon the shaft. The shaft also turns in a guide-bracket, a, fixed upon the frame A, which serves to hold the adjustable frame down upon its ways.

A sprocket or other suitable wheel, E, driven in any of the usual well-known ways from the harvester-gearing itself, is locked on the shaft by means of a groove and spline, and provided with an annularly-grooved collar, in which a yoke-plate, E′, Figs. 1 and 5, fits, to hold it upon its shaft. By removing this yoke-plate from the frame A, upon which it is secured, the sprocket-wheel and shaft can be drawn out endwise. An internal gear, e, and a spur-gear, e', are secured concentrically upon the sprocket-wheel, leaving an annular space between them.

A screw-shaft, F, mounted in a laterally-sliding journal-box, f, works at one end through a nut, F^1, connected with the adjustable frame by the hinged stirrup f^1, (see Figs. 1 and 2,) and carries at its other end a spur-pinion, f^2, which may be thrown into gear with either of the driving-gears e e', or held out of gear in the space between them by means of a shipping-lever, F^2, and suitable link-connections between this lever and the adjustable bearing f.

By this mode of construction, when the screw-shaft is rotated in one direction the binder-frame is moved one way, and when this motion is reversed the frame is adjusted the other way, and when the rotation of the shaft is stopped the binding mechanism is held in its adjusted position.

A binding-carriage, G, slides upon ways c^2 c^3 on the frame C. A sprocket-wheel, H, mounted on the outer end of the long shaft D, carries an endless driving-chain, I, which traverses a corresponding wheel, H^1, mounted on a slotted bracket, adjustable by means of a slot and set-screw to regulate the tension of the chain. (See Figs. 10 and 11.) A pin, i, on this chain works in a slot on one arm, j, of an elbow-crank, J, mounted on a stud-axle, K, on the traversing carriage G, in a manner similar to that shown in the Withington patent above mentioned. It will be observed, however, that by my mode of construction the sprocket-wheel is mounted directly upon the driving-shaft instead of upon an intermediate shaft, as in the patent above mentioned, thus dispensing with extra gearing, and, also, that my driving-chain traverses outside of the way on which the carriage slides, thus dispensing with a slotted box or guideway shown in said patent, as well as with half the chain.

The traversing carriage is temporarily locked at each end of its movement by means of a shell, k, on a collar of the elbow-crank J, which shell works over lugs or studs k^1 k^2, one being fixed upon the frame near the sprocket-wheels, (see Figs. 4, 6, 10, and 11,) while the other is fixed on the adjustable bracket H^2.

In order to prevent the carriage running faster than the chain, or, in other words, to prevent the slotted crank from overrunning its driving-pin, which might be the case in working on inclined surfaces, I mount a spring-latch, L, upon the slotted arm of the intermittently-rotating crank, and connecting it therewith by a pivot, l, intermediate of the length of the latch, provided with a spring, l^1, under its heel, which tends to keep the latch locked upon the pin, it being perforated for that purpose. (See Figs. 4, 6, and 7.)

It is necessary, however, that the pin should be free to traverse its slot at each end of its

stroke while passing around its driving-pulleys. To provide for this contingency I employ unlatching-cams or wipers l^3 l^4 upon each end of the adjustable frame B, which wipers are struck by a toe of the locking-latch to release the pin at the proper moment, as will be readily understood.

The short arm of the intermittently-rotating crank is connected by a pitman, M, to the crank *m* of a rock-shaft, M′, mounted upon the frame or upper part of the traversing-carriage, and carrying at its outer end the binder or wire-carrying arm N. This arm is slotted, both vertically and longitudinally, for the reception of a tucker or supplementary arm to carry the wire into the twisting mechanism; but I deem it unnecessary here to describe or show these details, as they are shown in Withington's patent, above mentioned, and also in the application of Lambert Erpelding, of Chicago, Illinois, filed January 27, 1877, and, moreover, constitute no part of the invention herein claimed.

A compressor, O, is pin-jointed at *o* to an overhanging arm, *b′*, of the binding-carriage. A link-rod, P, pivoted to the compressor-arm at *p*, and encircled by a spiral spring, passes through a swiveling-head on a heel or extension, *n*, of the binding-arm. (See Figs. 8 and 9.) By this mode of construction, when the compressor and binding-arm are retracted, the spring is uncompressed; but when the arm descends to compress the gavel, it compresses the spring, as shown in Fig. 8, and causes the compressor to squeeze the gavel while being bound tightly, but with an elastic pressure.

By this organization I am enabled, while securing an efficient wire-carrying device, to dispense with the extra pitman, rock-shaft, and crank shown in the Withington patent above mentioned.

The backward movement of the binding-carriage is arrested by means of an elastic stop or buffer, C′, against which it abuts, adjustably mounted upon the frame C, so as to vary the range of movement of the binder-carriage. This stop is, by preference, formed of rubber; but other elastic material might be employed, and thus prevent the injurious shock or concussion of metal striking against metal.

In a machine employing, as does the one hereinbefore described, two wires, it is desirable that the lower wire should be fed in regulated quantities at proper intervals, so as to permit the knot to move out of the way of the twister as the mechanism moves forward to bind each gavel. To this end the reel which carries the lower wire is mounted on a radius-bar, T, swinging on a pivot, *t*, on a down-hanger of the binding-carriage, being supported at its outer end in a stirrup, *t′*, by which means the radius-bar is free to move endwise, as well as laterally, to accommodate the rectilinear traverse of the binding-carriage.

The lower wire *u* passes from the reel u^1 around a small roller, u^2, on the radius-bar, and thence around a roller, u^3, on a supplementary swinging lever, U, pivoted to the binding-carriage concentrically with the radius-bar T. The wire also passes around a roller, u^4, on the pivot *t*, thence through a rotating tubular socket of a pulley, having a swiveling motion in its bearings, and thence to the twister. The two latter parts, however, are not shown in the drawings, but are shown in an application filed by Withington & Baker March 31, 1876, and also in an application filed by Lambert Erpelding January 27, 1877, as aforesaid.

During the movement of the binding-carriage in one direction, the free end of the supplementary radius bar or lever *u* abuts against a shoulder on a locking-latch, W, rocking vertically on a pivot, *w*, on the frame B, and being provided with a spring, which tends to keep it normally depressed, or its own weight might be sufficient for this purpose, the effect being to separate the outer ends of the two radius-bars, and thus draw a definite amount of wire from the reel at each reciprocation of the binding-carriage.

At a certain period of the stroke a wiper, *w′*, carried by the radius-bar T, abuts against the latch W, and forces it upward, thus releasing the supplementary radius-bar, and stopping the feed of the lower wire.

It is obvious that by making the wiper adjustable, or by putting an adjustable stop on the latch in well-known ways, the amount of feed could be adjusted to any desired extent.

It is neemed unnecessary here to describe the arrangement and operation of the upper wire, as they are fully set forth in the patent of Withington and the application of Erpelding, above mentioned.

The operation of my improved apparatus, generally speaking, is similar to that described in the Withington patent, above mentioned.

The rotation of the driving-shaft imparts a contiuous traversing movement in one direction to the driving-chain, which reciprocates the binding-carriage through the medium of the slotted intermittently-rotating crank J. In passing around the sprocket-pulleys at one end, this crank, through the intervention of the pitman M, oscillates the rock-shaft M′, thus elevating the grain-binder arm and tucker pivoted thereon, as well as the compressor-arm, (see Figs. 3 and 4,) the wire-carrying arm being held in its elevated position by means of the spring-latch L, and the binding-carriage being prevented from moving forward while this elevation of the wire-carrying arm is going on, by means of the shell *k*, and the pin with which it is engaged, from which pin it is released by the forward movement of the binding-carriage, and the binding-arm is fully elevated, as shown in Fig. 4.

The binding-carriage then moves forward until the driving-pin of the crank J travels

around the sprocket-wheel H, which turns down the wire-carrying arm and compressor to compress the gavel, and carry the wire into the twister. (See Fig. 8.)

The carriage then commences its backward movement, during which the wire is twisted and severed, as described in the patent and application above mentioned.

During this backward movement of the carriage the amount of wire desired to be used from the lower spool is fed out by means of the swinging levers or radius-bars above described, and suddenly released by the wiper or stop *w'* acting on the latch W, which release takes place before the bundle is removed, the slack of the under wire thus paid out being taken up by the raising of the binding-arm, and by the spring take-up before the binding-carriage begins its forward movement, whereby the knot joining the wires is permitted to rise above the twister.

I am thus enabled by my improvements to drive the binding-carriage directly from the driving-shaft, to dispense with a double box and crank, the double sprocket, the double chain, the double pitman, and one of the rock-shafts described in said Withington's patent.

It will be noticed, also, that by my improved construction the sprocket-wheels are overhung—that is, supported at one end on stud-axles—so as to leave room for the unobstructed operation of the crank and pitman, and for the traverse of the driving-chain.

What I claim as of my own invention, and desire to secure by Letters Patent, is—

1. The combination, substantially as hereinbefore set forth, of the fixed frame, the adjustable binder-frame, the hinged yoke pivoted thereto, the laterally-adjustable screw-shaft working therein, its spur-gear, and the concentric driving-gears between which it works, and with which it alternately engages, when desired to reverse the direction of adjustment of the binding mechanism.

2. The combination of the single overhung sprocket-wheel mounted directly on a driving-shaft, a corresponding overhung adjustable sprocket-wheel, a single driving-chain, its pin, the slotted intermittently-rotating crank, its pitman, the rock-shaft, and the wire-carrying arm mounted thereon, these members being constructed to operate in combination, substantially as hereinbefore set forth.

3. The combination, substantially as hereinbefore set forth, of a vibrating binding-arm, a traversing slotted intermittently-rotating crank, a spring-latch pivoted thereon, a pin on the traversing-chain which locks the crank, and releasing stops or wipers at each end of the frame, for the purposes specified.

4. The combination, substantially as hereinbefore set forth, of the vibrating binding-arm, a vibrating compressor pivoted eccentrically thereto, and an intermediate spring-rod connecting the compressor directly with an extension or heel of the binding-arm, whereby the compressor is actuated directly from the binding-arm.

5. The combination, substantially as hereinbefore set forth, of the frame C, the binding-carriage traversing thereon, and an adjustable elastic stop, to limit the backward movement of the binding-carriage.

6. The combination, substantially as hereinbefore set forth, of the traversing-carriage, a radius-bar pivoted thereto at its inner end, and sustained at its outer end by a support on the fixed frame of the machine, the lower or connecting-wire spool mounted on the outer end of said bar, a supplementary shorter radius-bar to which the wire passes, pivoted to the carriage, extending parallel with the long radius-bar and automatically vibrated at intervals independently of said bar, to draw the wire from the spool and supply slack, for the purpose specified.

7. The combination, substantially as hereinbefore set forth, of a traversing binding-carriage, a radius-bar pivoted thereto, a supplementary radius-bar supported on said carriage, pulleys on the respective bars, around which pulleys the wire passes, a latch acting on the supplementary radius-bar, and a stop carried by one of the bars and acting on the latch.

In testimony whereof I have hereunto subscribed my name.

WM. R. BAKER.

Witnesses:

R. NEWTON,

JOHN V. A. HASBROOK.