(No Model.)

5 Sheets—Sheet 1.

A. C. MILLER.

SELF BINDING HARVESTER.

No. 266,866. Patented Oct. 31, 1882.

Fig. 1.

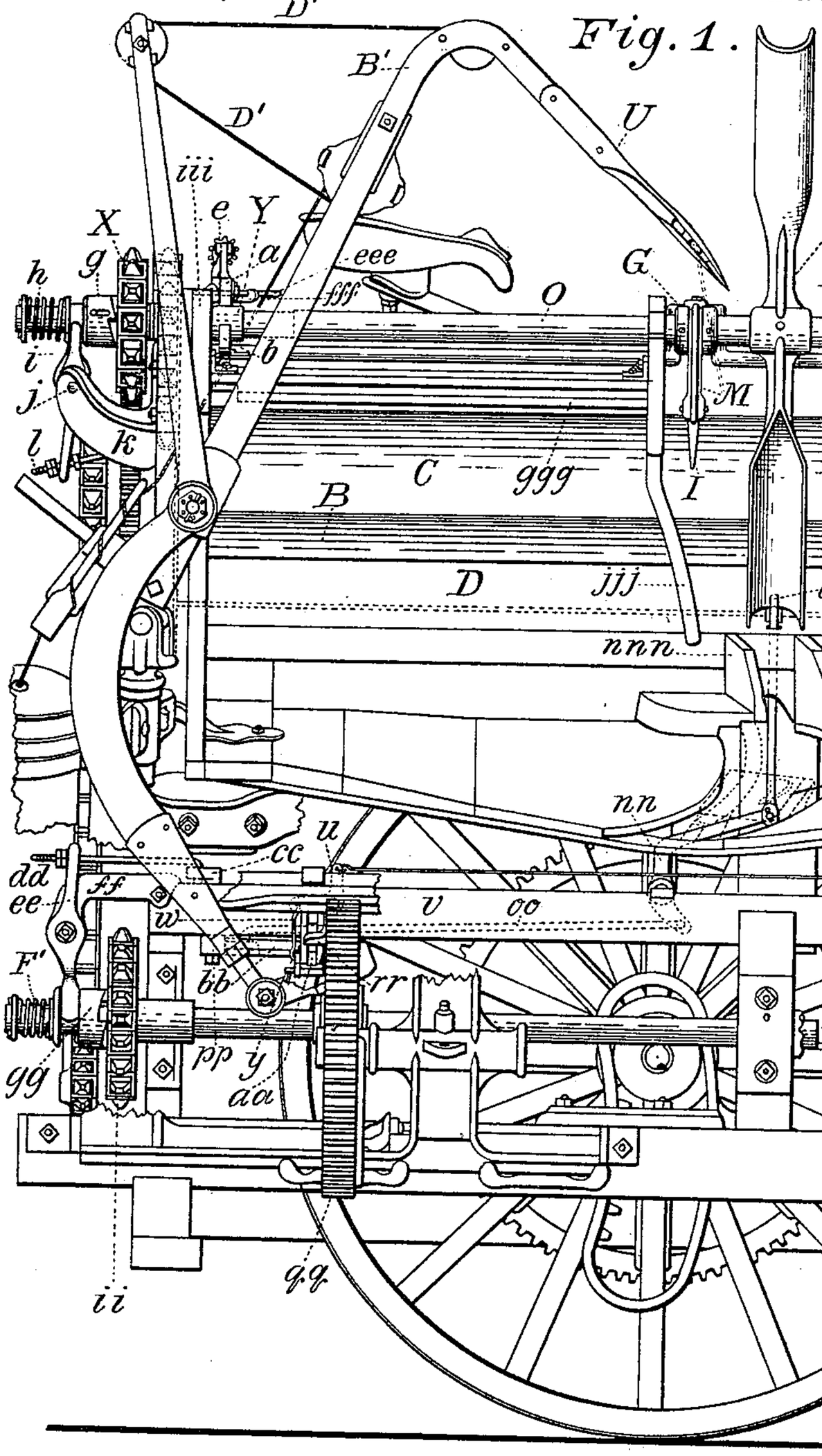
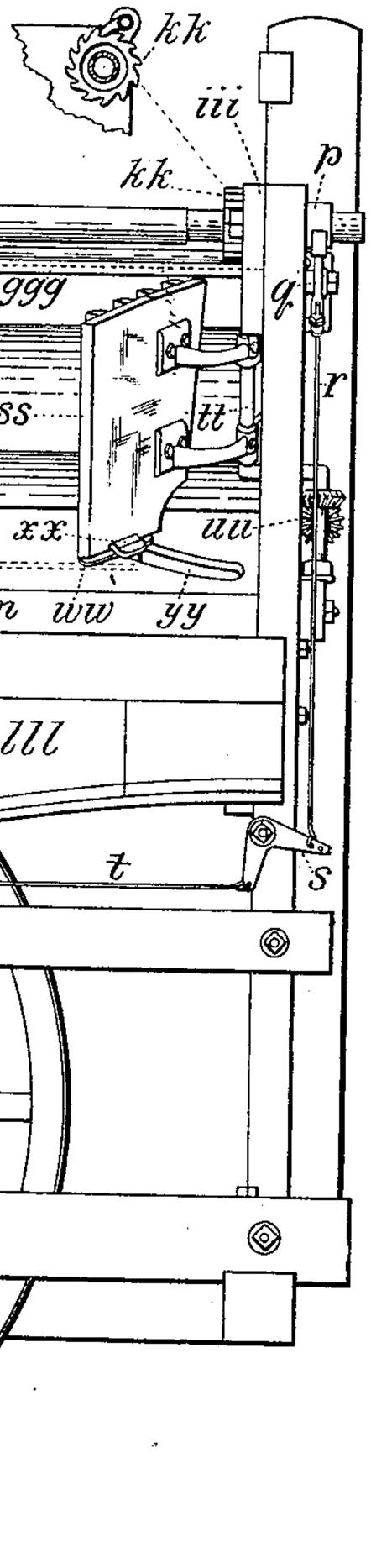


Fig. 2.



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(No Model.) 5 Sheets—Sheet 2.

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SELF BINDING HARVESTER.

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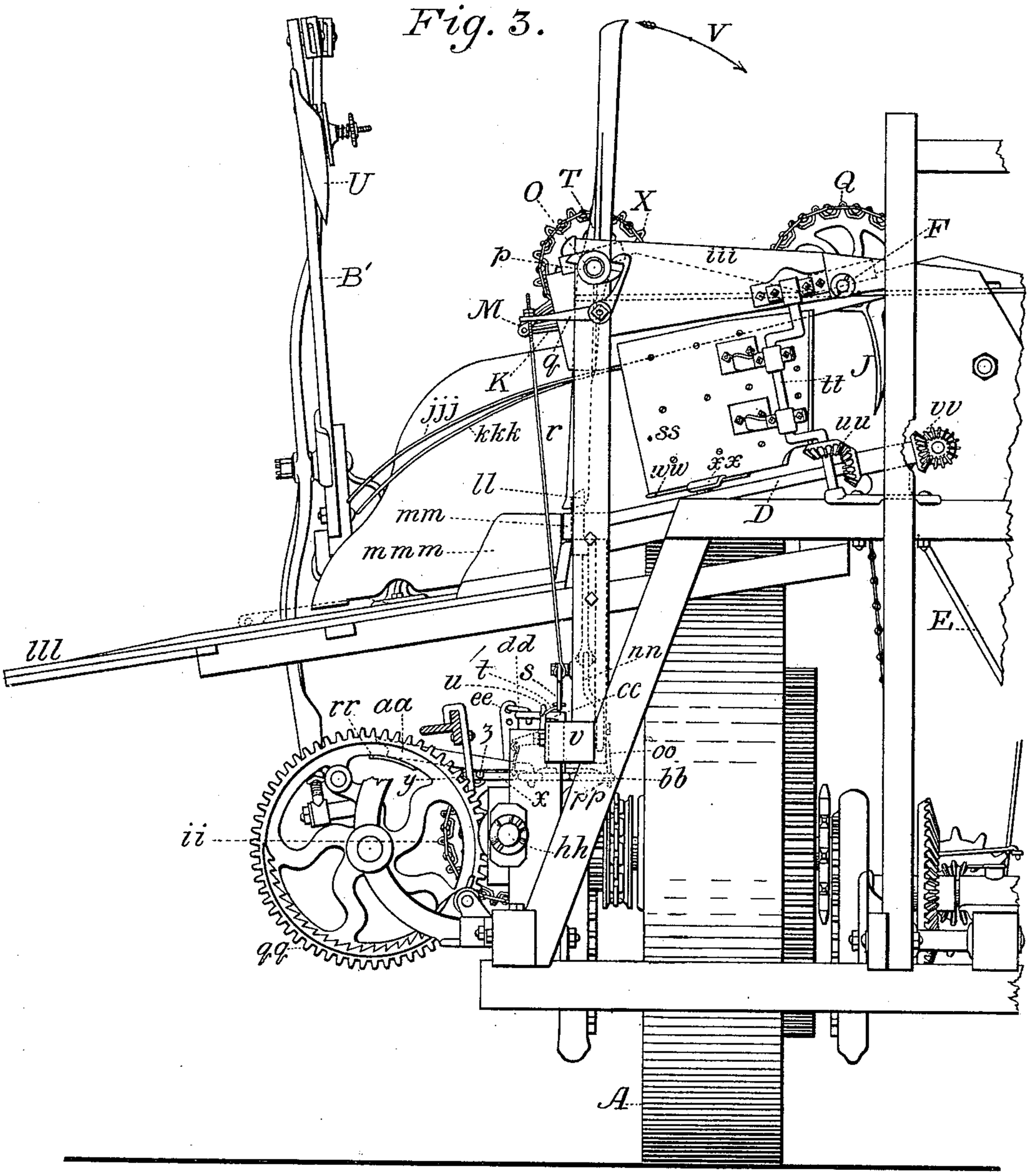
Fig. 3.



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(No Model.) 5 Sheets—Sheet 3.

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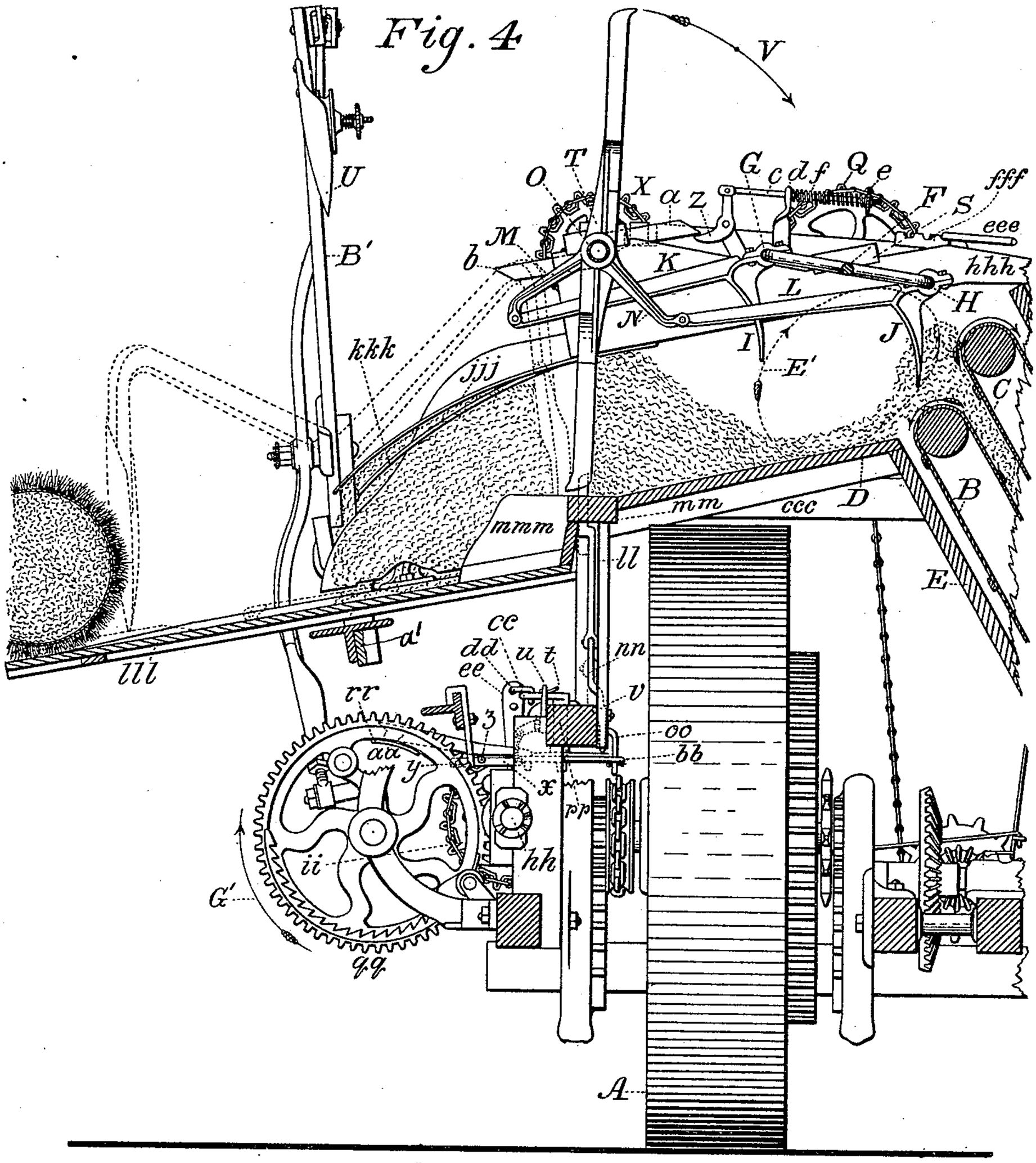
SELF BINDING HARVESTER.

No. 266,866. Patented Oct. 31, 1882.

Fig. 4



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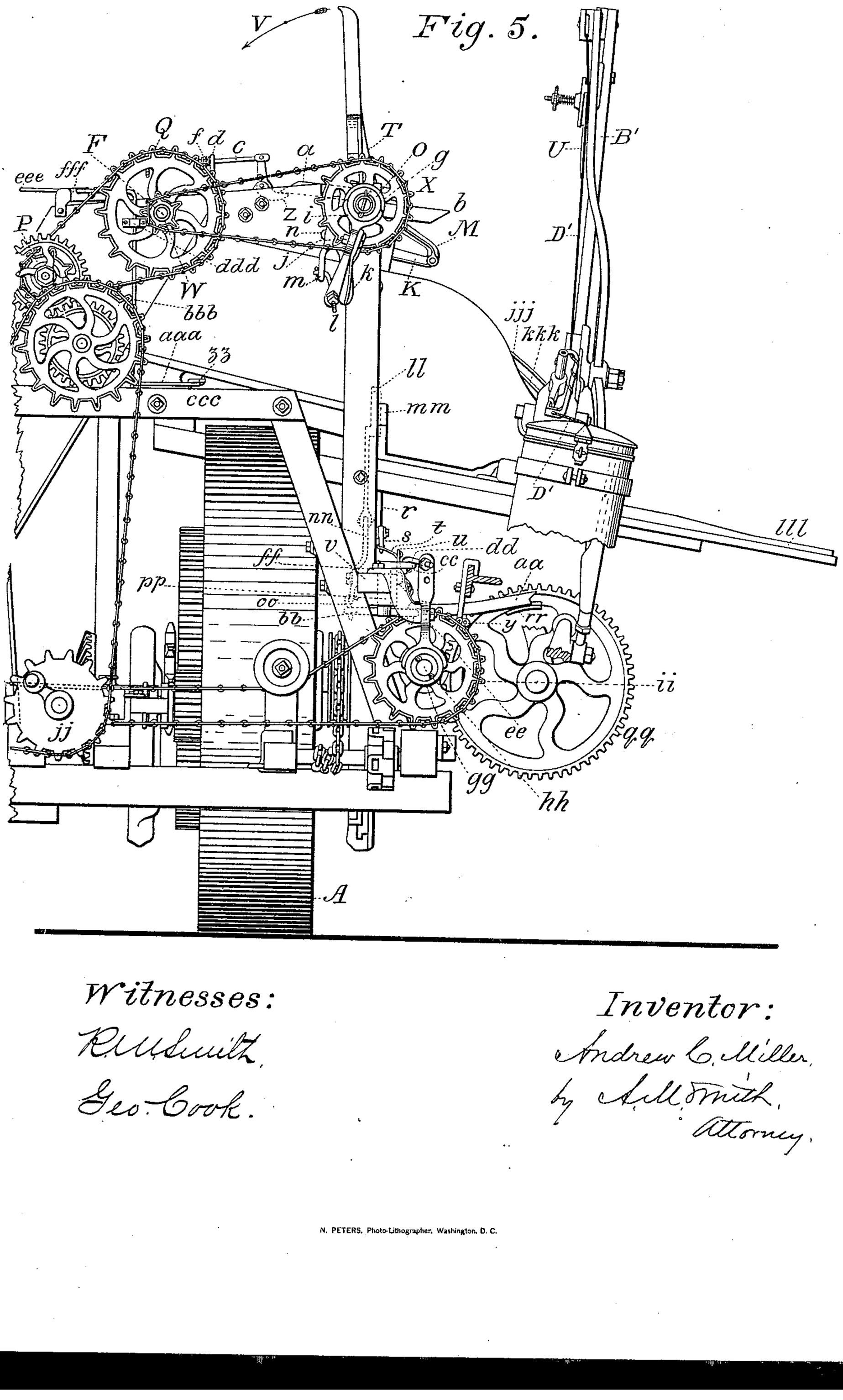
SELF BINDING HARVESTER.

No. 266,866. Patented Oct. 31, 1882.

Fig. 5.



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5 Sheets—Sheet 5.

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SELF BINDING HARVESTER.

No. 266,866. Patented Oct. 31, 1882.

Fig. 6.

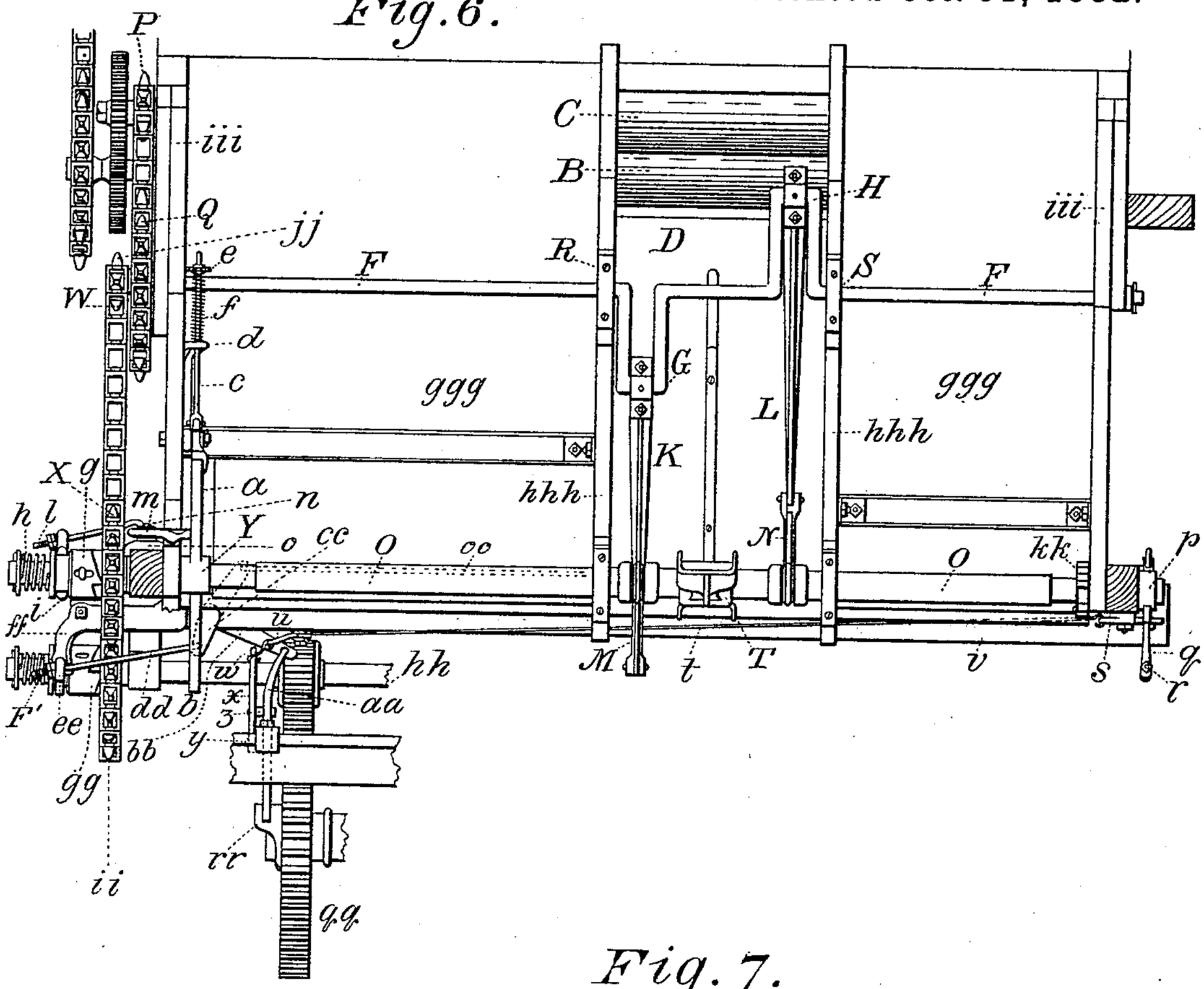
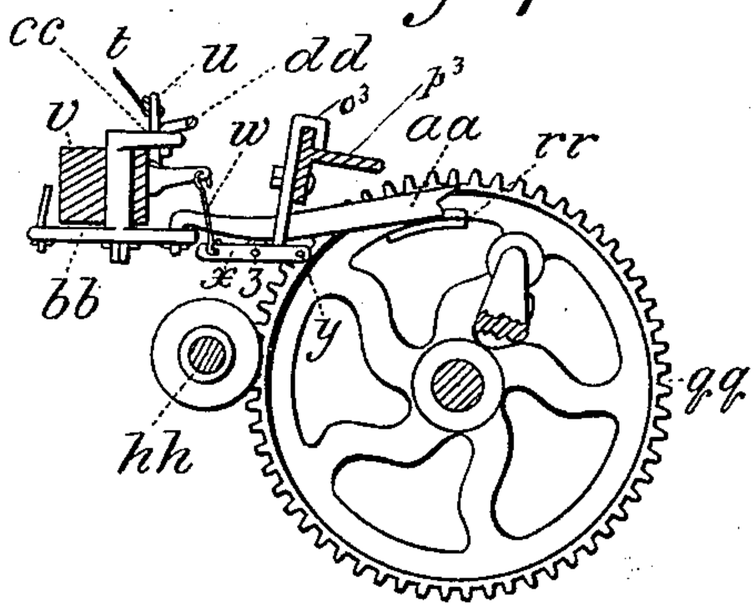


Fig. 7.



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UNITED STATES PATENT OFFICE.

ANDREW C. MILLER, OF SPARTA, ILLINOIS, ASSIGNOR OF ONE-HALF TO DAVID M. OSBORNE, OF AUBURN, NEW YORK.

SELF-BINDING HARVESTER.

SPECIFICATION forming part of Letters Patent No. 266,866, dated October 31, 1882.

Application filed March 16, 1882. (No model.)

To all whom it may concern:

Be it known that I, ANDREW C. MILLER, a citizen of the United States, residing in the town of Sparta, county of Randolph, State of Illinois, have invented new and useful Improvements in Self-Binding Harvesters, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 represents the improvements as they appear on a harvesting-machine when looking at it on the stubble or driving-wheel end of the harvester, the right-hand being the front or cutting apparatus side of the same. Fig. 2 is a detached view of a ratchet-wheel and pawl. Fig. 3 is a view of the same machine, looking at it in front of the driving-wheel. Fig. 4 is the same view in section, the division being made vertically and back of the butt-board and the front frame-work, showing the position of the grain and the several devices when in practical operation. Fig. 5 is a view of the same, looking at it when standing in the rear of or behind the driving-wheel. Fig. 6 is a top or plan view of the same, and Fig. 7 is a detached view of the binder gear-wheel and its driving-pinion and a portion of the stop and shifting mechanism,

The same letters of reference, where they appear in the several figures, indicate like parts of the machine.

In this machine so much thereof as relates to the harvester proper corresponds in construction to the harvester shown in the drawings and described in the specification now pending of my previous application, with this difference in its construction: the elevating-canvas has been shortened and has a less inclination, thus giving space over the main driving-wheel for a receiving-table for the grain as delivered from the discharging ends of the elevator-canvas.

The binding mechanism, which is not represented in the drawings to its fullest detail, is substantially the same in construction and operation as that shown in the drawings and described in the specification in the application referred to, and which is now pending before the Patent Office.

The improvement relates to an organization of devices located between the mouth or discharging ends of the elevating-canvas and the binding mechanism, by which a better separation is made between the following sheet of grain and the gavel being bound, the grain preparatory to being bound being compacted together until a sufficient quantity is accumulated for a bundle. Devices are also arranged and constructed for automatically separating gavels of determinate uniform size and automatically binding and discharging the same.

In self-binding harvesters a serious difficulty is often experienced in separating the gavel to be bound from the following sheet of grain, and various devices have been applied for the purpose, none of which have, I believe, proved perfectly satisfactory. Devices have also been applied to machines for compacting the gavel and delivering the same of uniform size automatically, to which objections have been raised, but which it is believed have been overcome in my improvements.

In the drawings, A indicates the main driving and supporting wheel of the harvester, which supports and carries the frame-work and major portion of the operating machinery and imparts to it the necessary motions through connecting devices, a small wheel at the outer end of the cutting apparatus carrying a minor portion of the same.

In Fig. 4 the position of the elevating-aprons B and C relatively to the driving-wheel is clearly shown, the direction of their movements being indicated by arrows at their upper ends. These elevating-aprons B and C are shorter than heretofore in use, and have less inclination, by which arrangement space is obtained for a grain-receiving table, D, which is located over the driving-wheel A. This grain-receiving table D is slightly inclined downward from the mouth of the elevating-aprons, and is united to the shield-board E, which is located under the lower elevating-apron, B. In order to move the grain back from the mouth of the elevating-aprons as fast as the same is delivered, and to compact the same in a quantity sufficient for a bundle, the following arrangement of devices is provided.

Over the receiving-table D, in front of the

elevating-aprons, and mounted in suitable bearings, is placed the crank-shaft F, which has double cranks G and H, Fig. 6. To these cranks are journaled the raking and packing teeth I and J, Fig. 4, having arms K and L, which are pivoted to the links M and N, which latter are journaled upon the shaft O, Figs. 1 and 4. The crank-shaft F has a rotary motion imparted to it from the sprocket-wheel P, Figs. 5 and 6, on the projecting end of the roller of the upper elevating-apron, C, united by a square link-chain to a sprocket-wheel, Q, on the projecting end of said crank-shaft F. The rotation of the crank-shaft F causes the points of the raking and packing teeth I and J to move in an elliptical path, as shown in dotted lines in the direction indicated by the arrow thereon, moving down in front in close proximity to the delivering ends of the elevating-aprons B and C, and moving back in close proximity to the surface of the grain-receiving table D, and carrying back with them the grain as fast as it is delivered from the elevating-aprons B and C, then rising and passing back over the sheet of grain that is flowing from the mouth of said elevating-aprons. But one tooth is shown to each rake-head. An additional number of teeth may, however, be used, if desired or found necessary.

In order the better to support and sustain the crank-shaft F, it has bearing-pieces R and S, Fig. 6, arranged upon each side of its cranks G and H.

The shaft O is supported in bearings made in the corner parts of the frame-work, outside of the driving-wheel A. To this shaft O is fastened the double arm-piece or revolving separator T. The front edges or sides of these arms, when down, are made concave or recessed to permit the needle-arm U in its operation to pass down behind all the grain that may be in front of the revolving separator T. The location of the revolving separator T is on a line midway between the raking and packing teeth I and J, so that in the revolution of the shaft O the arms of the revolving separator T will pass between said teeth and gather the grain that has been moved back by the action of the raking and packing teeth I and J. The direction in which the revolving separator moves is shown by the arrow V. In order to provide a stop against which the grain gathered by the raking and packing teeth may be pressed and compacted by their action, the revolving separator T has an intermittent motion of half a revolution.

The revolution of the shaft O is produced by a small sprocket-wheel, W, Figs. 5 and 6, on the crank-shaft F, outside of the sprocket-wheel Q, connected with a sprocket-wheel, X, upon the shaft O, by a square-link chain.

To the shaft O, on its rear or left-hand end, and inside of its bearing in the post, a cross-head, Y, is fastened, and its arms *a b*, Figs. 1, 4, and 5, project from the shaft at nearly right angles to those of the revolving separator T.

To the frame-work is pivoted, by a horizontal pivot, a catch-piece, Z, bell-cranked in shape, one branch of which reaches within the path of the arms *a b* in their revolution with the shaft O. The other branch extends above the pivot, and has pivoted to it a link-rod, *c*, which passes through a hole in an ear-piece, *d*, fastened to the frame, and has between it and the screw-nut *e* a coil-spring, *f*, which admits of the catch-piece Z yielding under pressure of the arms *a b* enough to let said arms pass by, the degree of pressure being determined by the screw-nut *e* being turned down on the rod to give greater force and back again to give less force to the coil-spring *f*. The shaft O extends through the sprocket-wheel X far enough for receiving a clutch, *g*, and coil-spring *h*, the clutch being prevented from turning on the shaft by a pin through the shaft O, and being free to move longitudinally on said shaft by means of a short mortise in the clutch. The sprocket-wheel X is free to rotate on the shaft O at all times, except when the clutch *g* is brought and held in locking contact with a corresponding clutch-surface on the said sprocket wheel, when the shaft and sprocket-wheel must revolve together. This contact is produced by the action of the coiled spring *h*. To hold the clutch *g* out of contact with the sprocket-wheel X, a forked lever, *i*, Fig. 1, is pivoted at *j* to a stand, *k*, fastened to the frame-work, the upper or forked end of which lever enters a groove in the clutch *g*, and the lower end extends below the pivot *j*, and has a hole through it at right angles to the pivot *j*, in which is inserted the end of a link-rod, *l*, having adjusting-nuts upon it. The other end of this link-rod *l* has a hook at right angles to its length. This is inserted in a hole in the lower end of the lever *m*, Fig. 5. This lever *m* is pivoted at *n* to a casting, *o*, Fig. 6, on the corner-post. It extends upward above its pivot, and is bent inward so as to stand in the path of the arms *a b* in their revolution. The inner edge of this lever *m* is made cam-shaped, so that the arms *a b* will act upon it as they come in contact with it and press the top of it outward, and through its connection with the forked lever *i* move the clutch *g* out of contact with the sprocket-wheel X, and so hold it until relieved by the further downward pressure and movement of the arms *a b*.

On the front or right-hand end of the shaft O, which projects beyond its bearing in the corner-post, is fastened a cam-wheel, *p*, Figs. 1 and 3, having cam-projections on its opposite sides. These cam-projections are arranged so as to stand nearly at right angles to the arms of the revolving separator T. To the post, below this cam-wheel *p*, is pivoted a cam-lever, *q*, having two branches, which project nearly at right angles from their pivotal point. One branch of this lever extends up in front of the cam-wheel *p* and rests against it, its upper end being cam-shaped and notched under to permit the projecting ends of the cam-wheel

p to enter the notch when in the proper position to do so, as seen in Fig. 3. The other end of the cam-lever *q* has a hole through it for receiving the end of the connecting-rod *r*, which has a screw thread and nut for adjusting it to the proper length. This connecting-rod *r*, at its lower end, is connected to one branch of a bell-crank, *s*, which is pivoted to the outer side of the corner-post. The other branch of the bell-crank *s* has a link-rod, *t*, Figs. 1 and 6, connected to it, the other end of which is connected with one branch of a bell-crank, *u*, which is pivoted to the beam *v*. The other end of the bell-crank *u* is connected by a short link, *w*, Fig. 7, to a lever, *x*, which has its other end pivoted at *y* to the lower end of a guide-piece, o^3, and has a projecting stud, *z*, attached to it about the middle of its length, which said stud extends under the push-bar lever *a a*. The push-bar lever *a a* extends back through a loop or guide, o^3, fastened to the frame-work p^3, and, extending downward, connects at its back end to another bell-crank, *b b*, which is pivoted to the under side of the cross-beam *v*. The pivot of this bell-crank extends up through the cross-beam *v*, and has on its upper end a short lever or arm, *c c*. (See Figs. 6 and 7.) To the end of this lever is connected one end of a rod, *d d*, its other end being connected with the upper end of the forked lever *e e* (see Figs. 5 and 6) through a hole, a screw thread and nut being provided for adjusting the length of the same. The lever *e e* is pivoted to an arm or stand, *f f*, which is bolted to the end of the cross-beam *v*, the forked end of the lever entering a groove in the clutch *g g* on the outer end of the binder driving-shaft *h h* Figs. 1 and 6. This clutch *g g* has a mortise and pin connecting it with the shaft in the same manner as the clutch *g* on the shaft O, and operates in the same way in connection with the sprocket-wheel *i i*, which has motion given to it from a small sprocket-wheel. Not shown, but placed inside of the crank-head *j j*, Fig. 5, through a square-link chain.

On the binder driving shaft *h h*, outside of the clutch *g g*, is a coil-spring, which acts in the same manner as the coil-spring *h* on the shaft O.

On the shaft O, on the opposite side of the post from the cam-wheel *p*, is fastened a ratchet-wheel, *k k*, having a pawl for holding the same and preventing a return movement of said shaft O.

A locking-bolt, *l l*, Fig. 1, is arranged to slide vertically through a mortise in the beam *m m*, in the path in which the arms of the revolving separator T travel. The lower end of the locking-bolt *l l* is pivoted to one branch of the bell-crank *n n*, which is pivoted to the cross-beam *v* on its back side, and to the other branch of *n n* is connected one end of a link-rod, *o o*, (see Figs 1, 3, 4, and 5,) the other end being pivoted to the bell-crank *b b* at *p p*. (See Figs. 3, 4, 5, and 7.)

On the binder gear-wheel *q q*, Figs. 5, 6, and 7, is a projecting lug, *r r*, which in the revolution of the wheel is brought against the end of the push-bar *a a*.

As the binder in this machine has a fixed position relatively to the harvester and its elevating-aprons, a butt-board, *s s*, is supported on a crank-shaft, *t t*, which is arranged at right angles to the grain-receiving table D. This crank-shaft has a rotary motion imparted to it by a double set of bevel-gear wheels, *u u v v*, and an intermediate shaft connecting it with the projecting end of the roller-shaft of the lower elevating canvas apron, B. This butt-board *s s* has on its lower edge a guide-piece, *w w*, working in a loop-piece, *x x*. This loop-piece has a stem that passes through a slot, *y y*, in the grain-receiving table D. To this stem is connected a rod, *z z*, which extends back under the grain-receiving table D, and is connected at its other end to an arm, *a a a*, on a vertical spindle, *b b b*, which is journaled in the cross-timber *c c c*, and has also another journal-bearing at *d d d*. The upper end of the vertical spindle *b b b* has a lever, *e e e*, Fig. 1, connected with it at right angles, so as to bring it within reach of the driver in his seat. A sector-plate, *f f f*, having notches in it for holding the lever *e e e* in its adjusted position, is attached to the frame-work in a proper position for the lever to sweep over and lock with it. (See Fig. 4.) The spindle *b b b* has its supports so arranged that it can be raised up to release the lever *e e e* from the notches when necessary to change the position of the lever. The butt-board *s s* has on its inner face a series of ribs arranged so as to be vertical to the grain-receiving table D. The ribs are shaped in cross-section like saw-teeth, the hooked part of the tooth standing outward.

Under the crank-shaft F, on each side of the raking and packing teeth I J and arms K L, are arranged shields *g g g*, so as to give sufficient space between them and the grain-receiving table D for the passage of the grain. These shields *g g g* are supported at their inner ends by the bars *h h h* and at their outer ends by similar bars, *i i i*. (See Fig. 6.) The bars *h h h* have the shaft O journaled in them, and are made deeper toward their outer ends, so as to bring their lower edges about parallel to the surface of the grain-receiving table D. To the lower edges of the bars *h h h* are fastened two bars of spring-steel, *j j j* and *k k k*, which project outward and are downwardly curved.

It will be seen that the binding-table *l l l* is set at the same angle as the grain-receiving table D, but on a lower plane. Two brackets, *m m m* and *n n n*, are arranged in the angle formed by the back of the binder-table *l l l* and the grain-receiving table D.

It will be seen from the drawings that the binding mechanism is inclined outward to correspond with the inclination of the binding-table *l l l*.

The binder-arm B′, which carries the cord D′ around the gavel, has a needle end, U, which

is pointed, so as to more readily enter and separate the gavel.

The knotter-carrying arm (indicated at *a'*, Fig. 4) vibrates laterally in an inclined plane conforming to the inclination of and underneath the binder-table, in unison with the lateral vibrations of the binder-arm, and carries upon its swinging end the band-uniting mechanism covered by the slotted shield-plate. (Indicated in dotted lines at a^2, Fig. 1.)

As the binder mechanism is the same in construction and operation as that shown and described in an application of mine now pending before the Patent Office, and the harvester to which it is attached is the same in construction and operation, it is not deemed necessary to more minutely describe those parts.

Having thus fully described the construction and arrangement of the several parts of my invention, I will now set forth their operation.

The grain, as the harvester moves forward, is cut and falls upon the carrying-canvas in rear of the cutters, which carries it to the elevating-aprons, that receive it between their moving canvases and elevate and discharge it upon the receiving-table D. As fast as it is delivered from the mouth of said elevating-aprons B C the raker and packer teeth I J, by the rotation of the shaft F, seize and move back the grain from the aprons, the raker and packer teeth moving in the direction shown by the curved arrow E' in the dotted ellipse. As the grain is moved back it accumulates against the down arm of the revolving separator T, Fig. 4, and as it is pressed back by the continued action of the raker and packer teeth I and J it becomes compacted against the said arm firmly enough to cause the same to overcome the restraining pressure of the catch-piece Z, which turns on its pivot and permits the arm of the cross-head Y, which may be in contact, to pass it, the coil-spring *f* yielding so as to permit it to do so. The pressure of the grain against the arm of the revolving separator T continues to rotate the shaft O until the arm of Y passes off from the cam-projection of the lever *m*, Fig. 6, when the recoil of the spring *h* on the end of the shaft O throws the clutch *g* into action with sprocket-wheel X, and the shaft is made to revolve half of a revolution in the direction of the arrow V. The arm of T that is up reaches into and brings forward all the grain within its sweep. Before the arm, with the grain in its grasp, has reached a vertical position one of the projections on the cam-wheel, *p*, Figs. 1 and 3, at the end of the shaft O, acts upon the cam-lever *q* and forces out its upper branch and raises the rod *r*, which, through its connection with bell-crank *s*, Fig. 1, link-rod *t*, bell-crank *u*, and short link *w*, Figs. 6 and 7, connected to lever *x*, serves to raise said lever *x*, and the projecting stud *z*, attached thereto, serves to raise the push-bar *a a* from the lug *r r* of the gear-wheel *q q*. The lever being released, the recoil of the spring F' on the end of shaft *h h* forces the clutch *g g* into action with the sprocket-wheel *i i*, which causes the shaft *h h* to rotate and give motion to the gear-wheel *q q* in the direction of the arrow G', Fig. 4, and through it to the binding mechanism, the needle-point U descending in the concave or recessed face of one of the arms of the revolving separator T and behind all of the grain said arm in its revolution has brought forward. (For different positions of needle and binder arm see dotted and full lines in Fig. 4.) The needle, as it descends, carries the cord over and around the separated gavel, and as it moves outward the bundle is bound and discharged on the ground from the front edge of the binding-table *l l l*. Immediately after the binding mechanism is put in motion, as I have described, and before the needle-arm U has commenced its descent in front of one of the arms of the revolving separator T, the continued rotation of the shaft O has brought one of the arms of the cross-head Y into contact with the cam-surface of the lever *m*, Fig. 6, forcing it back, and by means of its connection with the forked lever *i* the clutch *g* is thrown out of action and held out during the time required for another gavel to gather in sufficient quantity to make a bundle.

The locking-bolt *l l*, Fig. 1, being connected with the forked lever *e e* through rod *d d*, Figs. 6 and 7, short lever or arm *c c*, bell-crank *b b*, rod *o o*, and bell-crank *n n*, is forced up in front of the lower end of one of the arms of the revolving separator T whenever the push-lever *a a* is released from the lug *r r* of the wheel *q q*, and the coil-spring F' on the end of shaft *h h* is left free to act upon the clutch *g g*. This locking-bolt *l l* remains raised in front of the arm of T until the wheel *q q* has made a complete revolution, when the lug *r r* of the wheel *q q* is brought again against the push-bar lever *a a*, and it is forced back until the clutch *g g* is again thrown out of action, the locking-bolt drawn down, and the binding mechanism automatically stops until the pressure of the gathering grain against the down arm of the revolving separator T again forces the shaft O to revolve and carry the arm of Y past the catch-piece Z, when the clutch mechanism of the shaft O causes it to make another half-revolution, as previously described. This locking-bolt *l l* serves to hold the down arm of the revolving separator T from revolving during the movement of the needle with the bundle outward, which might be the case in tangled grain; and this locking serves to hold the arm against any partial movement outward until the bundle is fully bound and the needle-arm has returned to its starting-point, when the bolt is withdrawn automatically. It will thus be seen that the grain, as it accumulates on the receiving-table, is carried back by the raking and packing fingers and compacted against the back side of the arm that may be down until the pressure becomes strong enough to move it outward against the pressure of the catch-piece Z, the amount of the pressure be-

ing determined by the force of the spring *f*, which may be increased or diminished by turning the screw-nut *e* on the rod *c*. As soon as the accumulated grain gives the necessary pressure to move the down arm of Y, a half rotation of the shaft takes place and the gathered gavel is separated from the sheet that is flowing from the mouth of the elevating-aprons, and the binding mechanism comes into action, the needle descends and moves the gavel outward during the process of binding, thus fully completing the separation of the bundle bound from the following gavel to be bound. Thus it will be seen that while the cutting and elevating process is going on continuously the gathering of the grain into gavels and the binding of the same into bundles are intermittent. On the receiving-table, between the mouth of the elevating-aprons and the separator-arm, the gavel is gathered and compacted and partially separated from the flowing sheet of grain, the elevating-aprons at all times being kept clear from an accumulation of grain at their mouth, which would otherwise tend to clog them.

The next stage is to separate the accumulated and compacted gavel from the flowing sheet of grain. The action of the revolving separator T in its semi-rotation accomplishes this by the arms thereof in their rotation reaching within the path of the raking and packing teeth I and J, and, in conjunction with their action, making the separation at the thinnest point in the sheet of flowing grain. The semi-rotation of the separator brings the gavel forward to the binding-table *l l l* in a compact shape, the bars *j j j* and *k k k*, which are curved downward, holding it compacted until the action of the binder-arm has encircled it with the cord, and the gavel is moved outward in the process of completing the bundle and discharging the same upon the ground. The revolving separator T remains stationary during the process of the binding of the bundle, and holding back all the grain between it and the elevating-aprons, the separation of the bound bundle from the following gavel and bundle is complete—a result which cannot be obtained when the band is put around a gavel in near proximity to the mouth of the elevating-aprons, and no reliance can be placed upon any heretofore known methods of making a proper separation.

The ratchet-wheel *k k* on the shaft O, in connection with its pawl, serves to hold the shaft O against any tendency to a backward rotation, which it might be inclined to have in certain conditions of the grain, by the action of the binder-needle U in its passage down in front of the revolving separator T.

As this binder and its mechanism at all times preserves the same relation to the elevating-aprons, the butt-board *s s* serves, in conjunction with the raking and packing teeth, to move the grain endwise on the grain-receiving table D, and thus bring it in the right position for binding in a proper manner.

By the location of the table which receives the grain from the elevating-canvas immediately over the driving-wheel, and the arrangement of the packing-fingers and the butting-board in connection therewith, as explained, I am enabled not only to shorten the elevating-canvas, but also to utilize the space occupied in the width of the machine by said wheel in compacting the grain and moving it endwise for getting it into shape and the desired position to be acted upon by the separating and binding mechanisms, thereby reducing the height and width of the machine and bringing it into more compact form.

Having thus fully described the construction and operation of my improvements in self-binding harvesters, what I claim to be new, and desire to have secured to me by Letters Patent, is—

1. In a grain-binding harvester, the combination, with the elevating-canvas, of the receiving-table located over the main driving-wheel and the raking and packing fingers working above said table and wheel.

2. The table for receiving the grain from the elevating mechanism, located over the main driving-wheel, in combination with the packing-fingers and the intermittingly-revolving separator working above said table.

3. The receiving-table located over the main driving-wheel, in combination with raking and packing fingers working over said table and wheel, a binder-table and binding mechanism located outside of the longitudinal vertical plane of said wheel, and the intermittingly-rotating separator, arranged and operating substantially as described.

4. The receiving-table located over the main driving-wheel, and the binding-table and binding mechanism located on the outer side of said receiving-table, in combination with the packing-fingers working above said table, and the intermittingly-rotating separator interposed between said packing-fingers and the binding mechanism, substantially as described.

5. The inclined receiving-table located over the driving-wheel, and the inclined binder-table receiving the grain from said receiving-table, in combination with the revolving separator and the fingers *j j j* and *k k k*, projecting over the binder-table, substantially as and for the purpose set forth.

6. The combination, with the inclined receiving-table located over the driving-wheel, of the double elevating-aprons delivering the grain thereto, packing-fingers working above said table, an inclined binder-table receiving the grain therefrom, mechanism for binding the grain on said binder-table, and an intermittingly-revolving separator interposed between the packing-fingers and the binding mechanism, all arranged and operating substantially as described.

7. In combination with the revolving separator, a yielding stop mechanism consisting of the cross-head Y and its latch Z and the adjusting devices, arranged and operating substantially as described.

8. The combination of the raking and packing fingers, arranged to operate above the receiving-table D, the revolving separator, also working above and over the discharging edge of said table, and the shield-boards arranged above said table and on each side of said fingers and separator, substantially as described.

9. The combination, with the revolving separator, of the cross-head Y, sprocket-wheel X, and its clutch *g*, intermediate shifting devices operated by the cross-head to throw the clutch and sprocket-wheel out of engagement, and the spring for throwing said parts into engagement, substantially as described.

10. The intermittingly-revolving separator T, having the concavo-convex separating-arms, in combination with the sliding bolt for locking said arms, and the binder-needle working within the concave face of said arms for effecting a separation of the grain, substantially as described.

11. The combination of the cam-wheel *p* and the cam-lever *q* and its connecting devices with the clutch *g g* and sprocket-wheel *i i*, substantially as and for the purpose described.

12. The combination, with the elevating-canvas and the table receiving the grain therefrom, located over the driving-wheel, of the raking and packing fingers and the vibrating butt-board working above said table and wheel, substantially as described.

13. The combination of the double elevating-canvas, the receiving-table located over the driving-wheel, the raking and packing fingers for moving the grain outward over said table, and the vibrating butt-board and intermittingly-rotating separator, arranged and operating relatively thereto substantially as described.

14. The combination of the double elevating-canvas, the table receiving the grain therefrom, located over the driving-wheel, the raking and packing fingers, vibrating butt-board, and intermittingly-rotating separator working above said table, and a binder-table and mechanism for binding the grain thereon, located on the outer or stubble side of the driving-wheel, substantially as described.

15. The revolving separator-shaft provided with a sprocket-wheel, in combination with the chain and sprocket-wheel connecting said shaft with the packer-shaft, substantially as described.

16. The combination of the double elevating-canvas, the table for receiving the grain therefrom, located over the driving-wheel, the raking and packing fingers, vibrating butt-board, and intermittingly-rotating separator, all arranged and working above said table, the inclined binder-table arranged outside of and on a lower plane than said receiving-table, and mechanism for binding the grain on said binder-table, all arranged and operating substantially as described.

17. The combination of the cam *p* and the cam-lever *q* and its connecting devices with the lever *x*, having the pivot *y* and stud *z*, and operating the push-bar lever *a a*, substantially as and for the purpose described.

In testimony whereof I have hereunto set my hand this 20th day of February, A. D. 1882.

A. C. MILLER.

Witnesses:
C. W. UPHAM,
CHAS. W. TOWERS.