(No Model.) 4 Sheets—Sheet 1.

L. MILLER.

GRAIN BINDING HARVESTER.

No. 329,931. Patented Nov. 10, 1885.

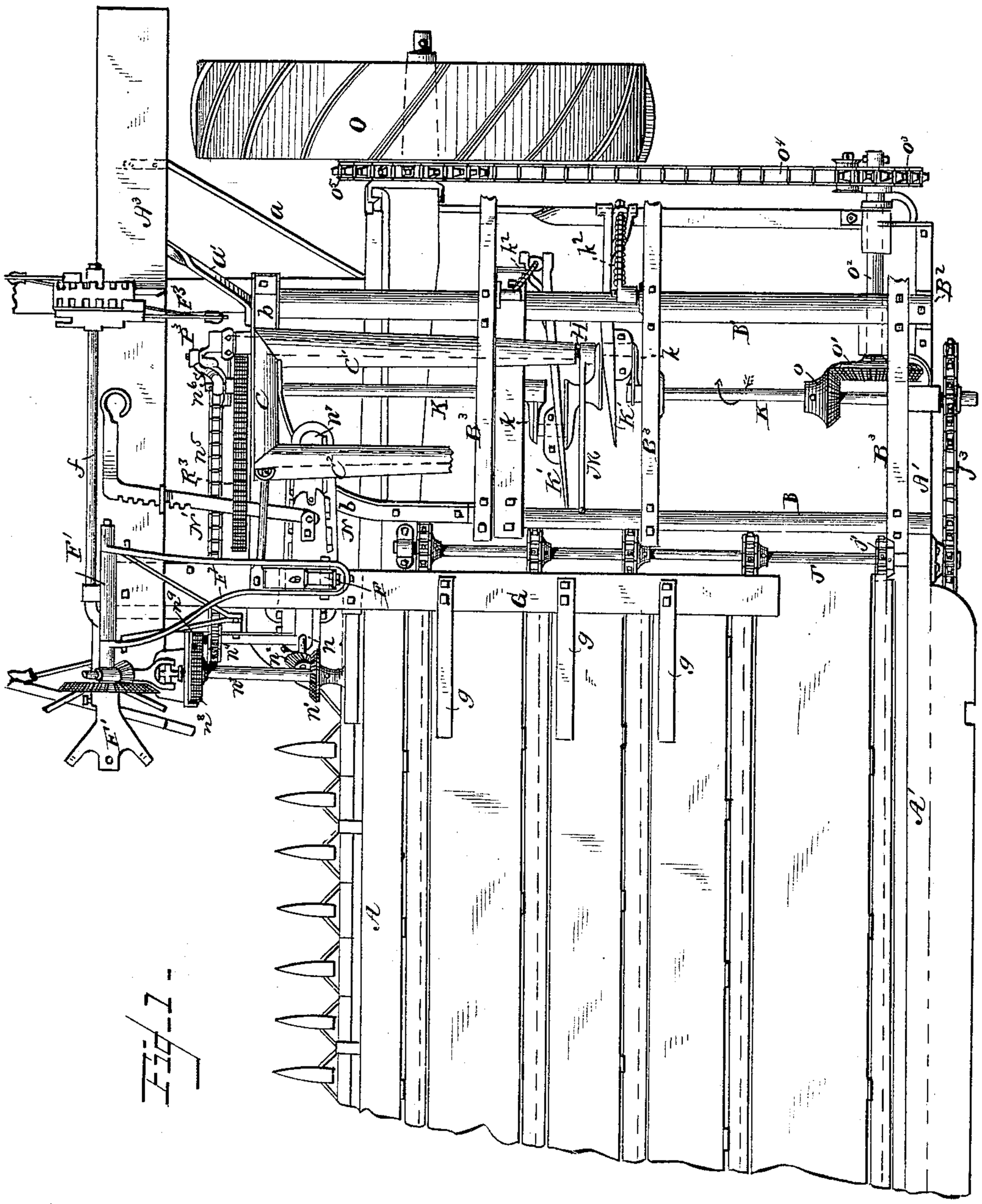

Fig. 1.

WITNESSES

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(No Model.) 4 Sheets—Sheet 2.

L. MILLER.

GRAIN BINDING HARVESTER.

No. 329,931. Patented Nov. 10, 1885.

Fig. 2.

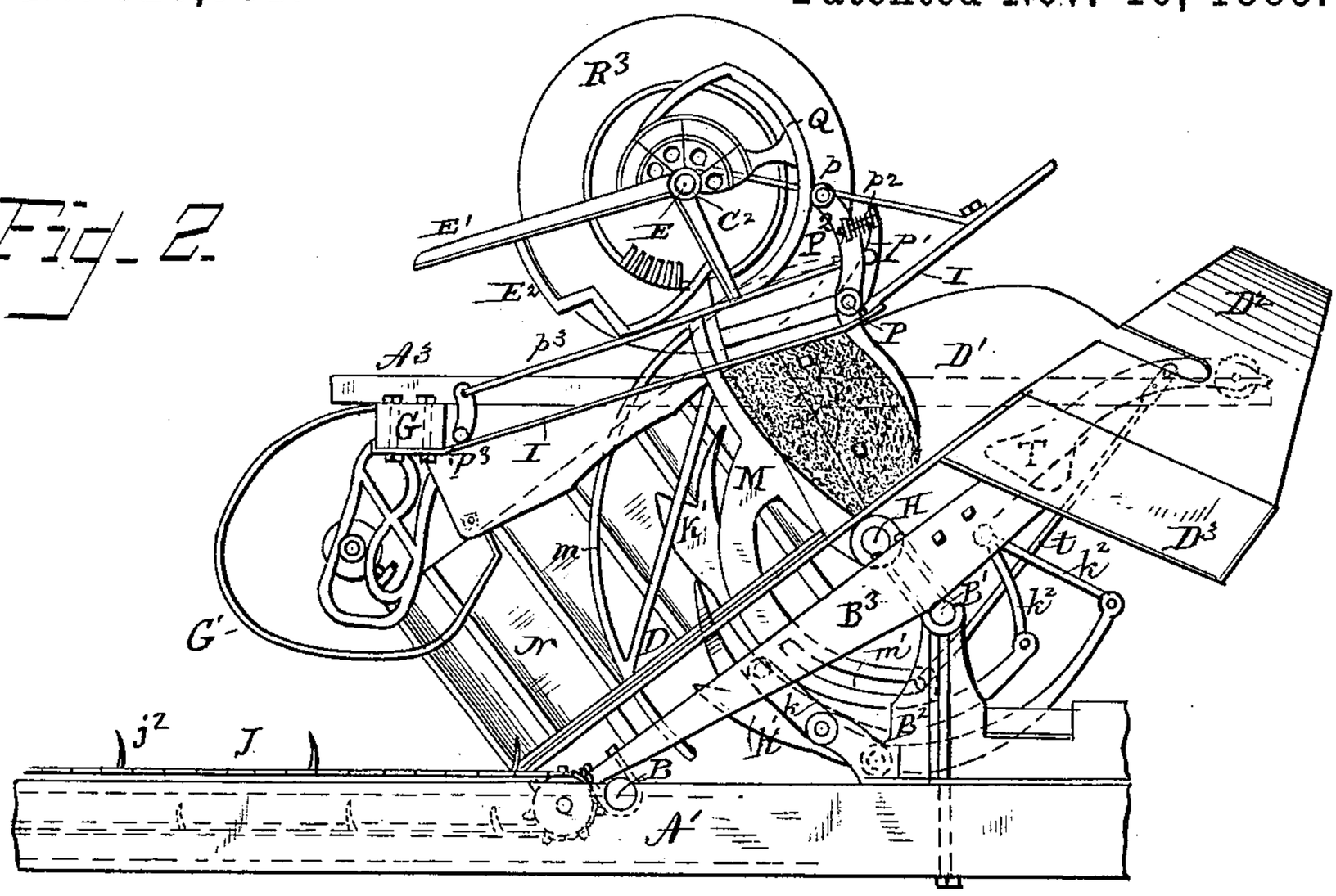


Fig. 3.

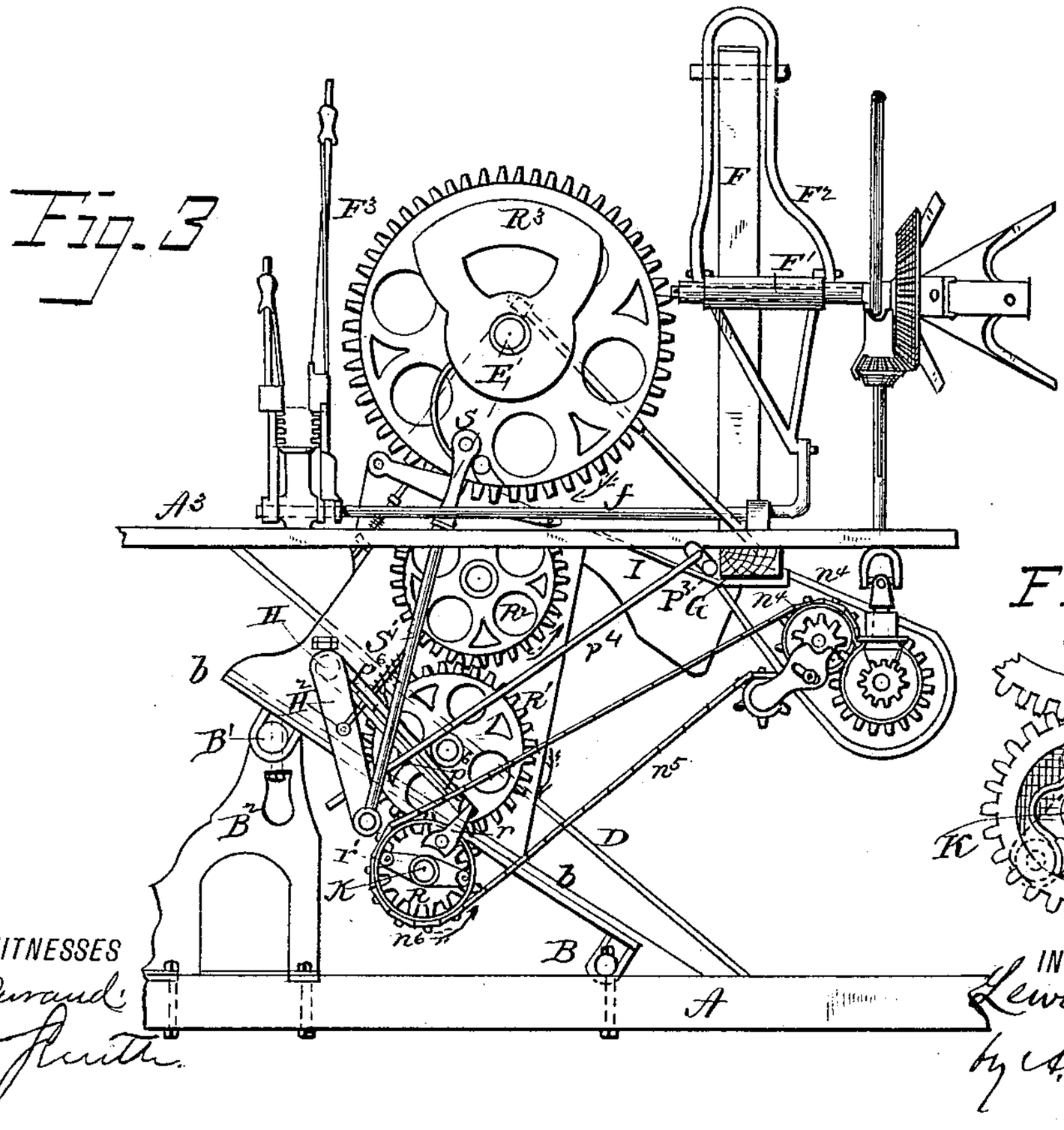
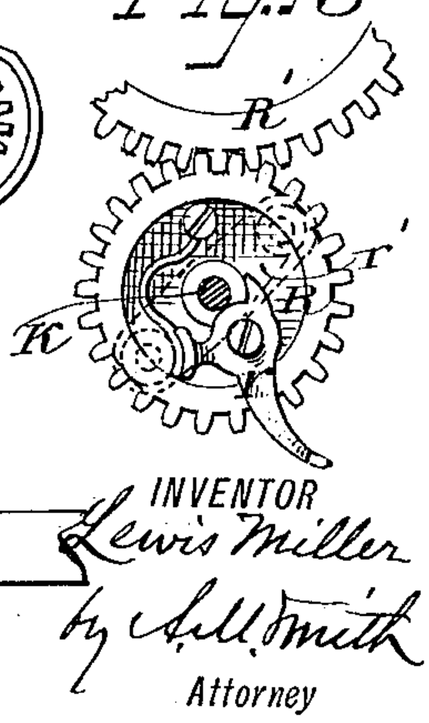


Fig. 13.



WITNESSES

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(No Model.)

4 Sheets—Sheet 3.

L. MILLER.

GRAIN BINDING HARVESTER.

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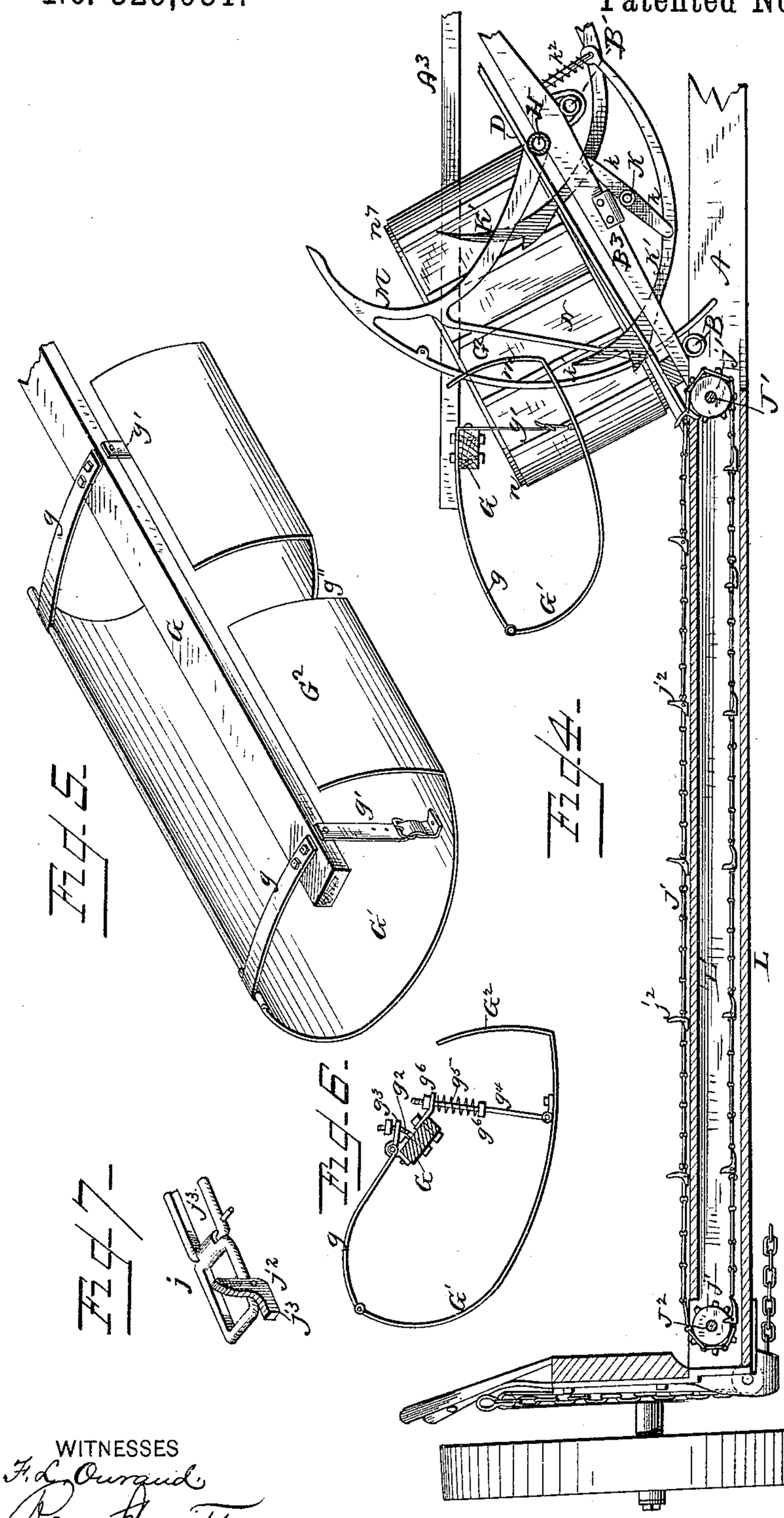

WITNESSES

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Per. Smith.

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ATTORNEY

(No Model.)

4 Sheets—Sheet 4.

L. MILLER.

GRAIN BINDING HARVESTER.

No. 329,931. Patented Nov. 10, 1885.

Fig. 8.

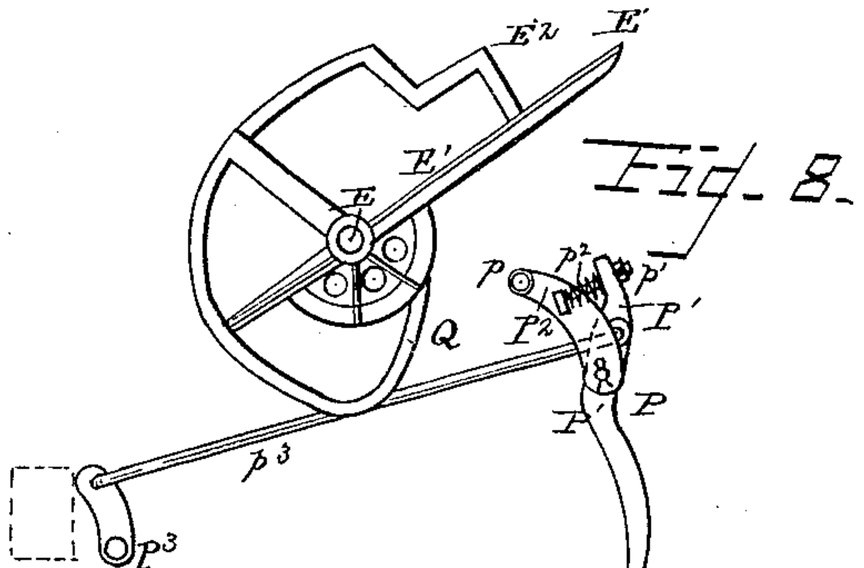


Fig. 11.

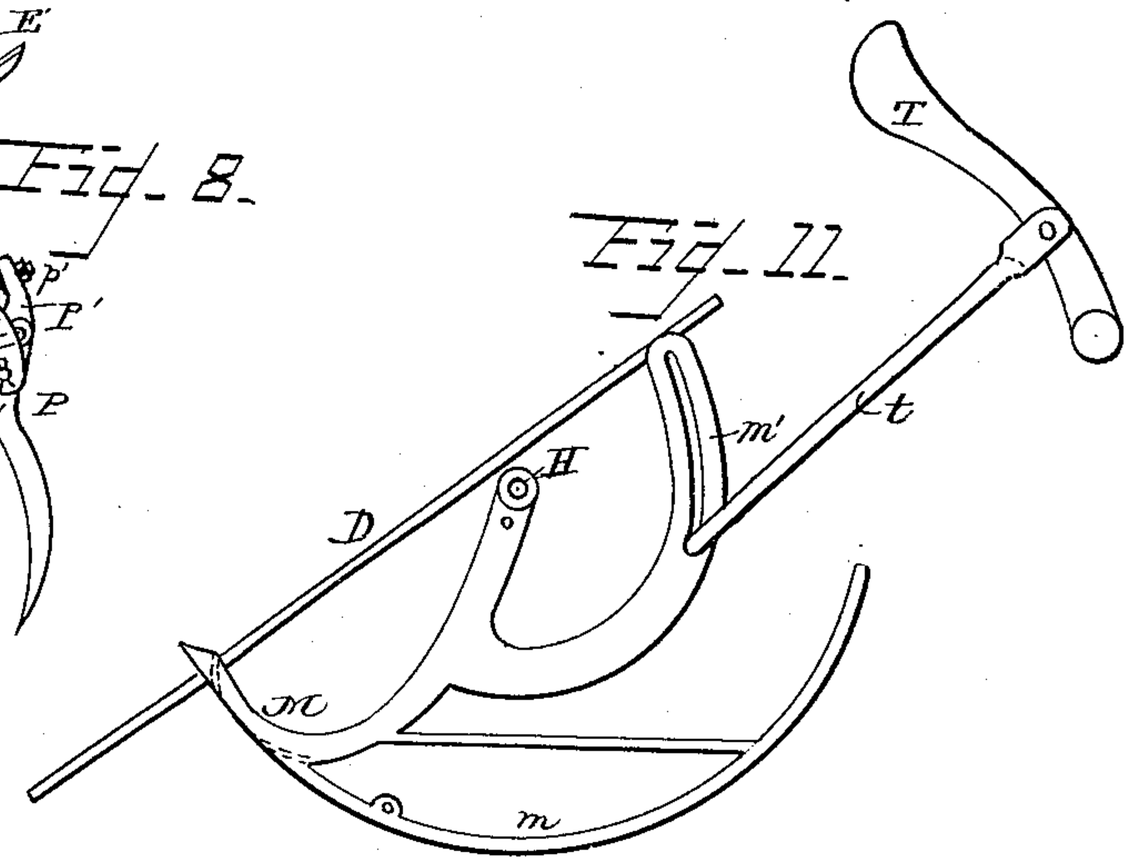


Fig. 12.

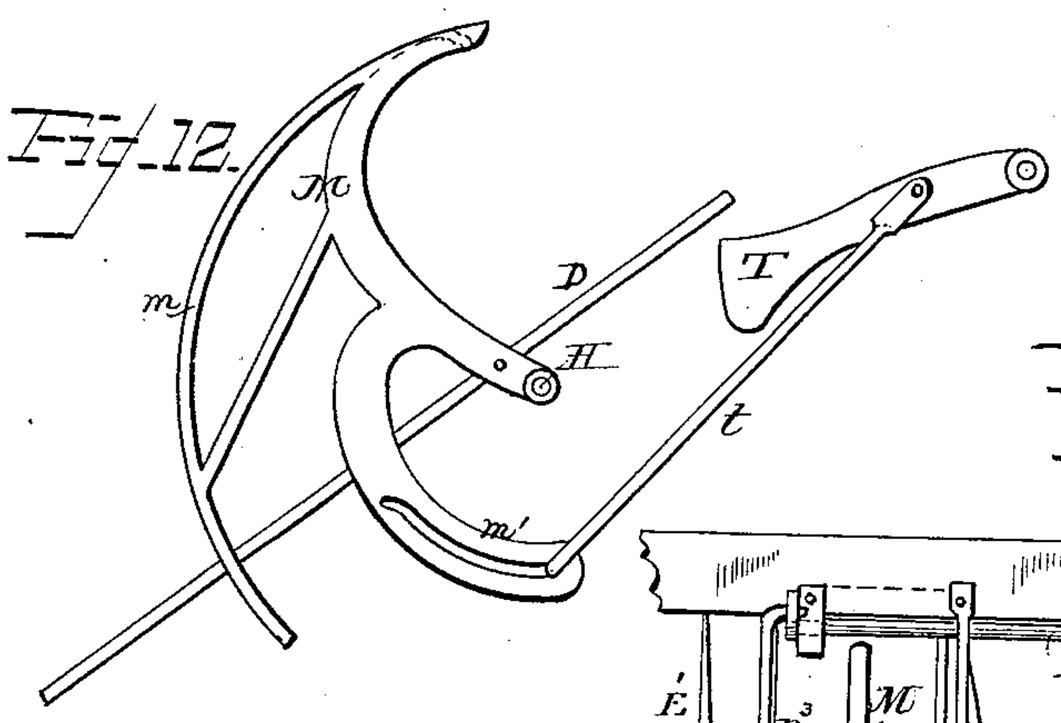


Fig. 9.

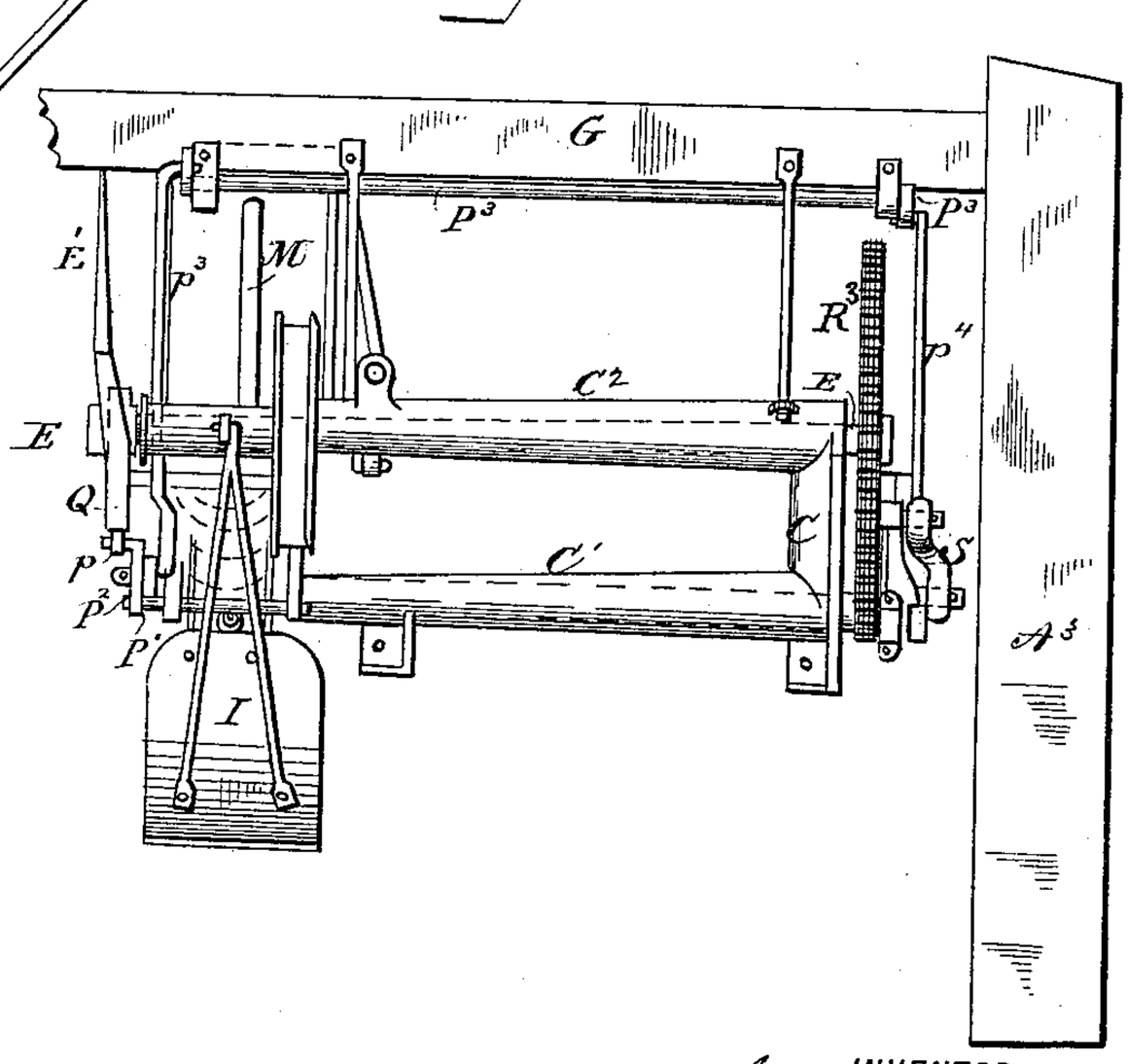
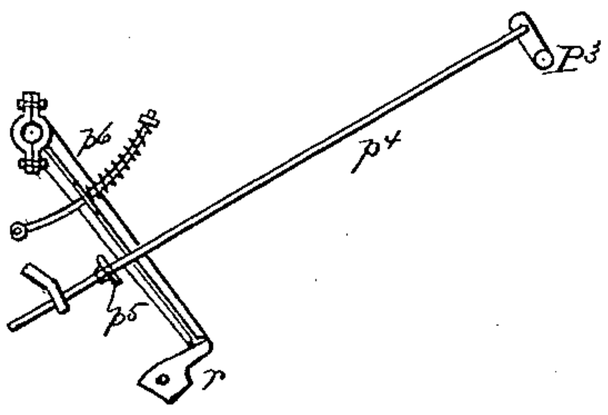


Fig. 10.



WITNESSES

F. L. Durand.

R. H. Smith.

INVENTOR

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Attorney

UNITED STATES PATENT OFFICE.

LEWIS MILLER, OF AKRON, OHIO.

GRAIN-BINDING HARVESTER.

SPECIFICATION forming part of Letters Patent No. 329,931, dated November 10, 1885.

Application filed June 2, 1883. Serial No. 96,910. (No model.)

To all whom it may concern:

Be it known that I, LEWIS MILLER, of Akron, county of Summit, and State of Ohio, have invented a new and useful Improvement in Grain-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.

My invention relates to a novel construction of platform rake and carrier, and to a novel arrangement of binder-table and packers relatively thereto, for adapting said packers to take the grain directly from the carrier without the interposition or aid of the usual intermediate packers or elevating devices; to a cut-off for intercepting the grain at the foot of the incline; to a novel arrangement of yielding float for holding the grain received from the platform-carrier down upon the inclined elevating binder-table; to the action of the packers; to an improved construction and arrangement of compressor, delivery, and ejector arms, and means for starting the binder mechanism and discharging the bundle from the machine, as will be understood from the following description, in connection with the drawings, in which—

Figure 1 is a plan view of the machine, with the grain end of the platform and finger-bar broken away; Fig. 2, a rear elevation of the machine, with a portion of the framing and the wheel broken away; Fig. 3, a front elevation of a portion of the frame, showing the gearing for operating the reel and binder mechanism; Fig. 4, a vertical transverse section through the platform of the machine, showing the carrier, needle-arm, float, packers, and a portion of the inclined binder-platform arranged upon the grain side of the wheel. Fig. 5 is a perspective view of the yielding float; Fig. 6, a transverse section through the float; Fig. 7, a perspective view of a short section of one of the carrier-chains employing a folding tooth; Fig. 8, an elevation in detail of the bundle-deliverer and upper compressor, with their connections; Fig. 9, a plan view of parts connecting the upper compressor with the clutch for operating the binder-gearing; Fig. 10, a detail in elevation showing a portion of said clutch-operating mechanism; Fig. 11, a detail in elevation of the needle and ejector-arm, showing the needle depressed and the arm raised above the platform; and Fig. 12, a similar view of said parts, showing the needle in its raised and the ejector in its depressed position. Fig. 13 is an enlarged view, in detail, of the clutch between the binder-gear and the main binder-gear shaft.

The machine in its general arrangement of parts is similar in construction to that described in other applications filed by me, in which the inclined binder-table is interposed between the platform-carrier and the main drive-wheel, and in which the grain is carried upward in the process of binding, and is discharged upon the outer or stubble side of the wheel; and it need not therefore be here described further than is necessary to an understanding of my present improvements.

A forward platform-sill or frame-bar, A, which may also serve as the finger-bar, is firmly jointed or connected to a similar sill, A′, employed at the rear of the platform, and upon these two sills the inclined binder-frame is supported. This binder-frame consists of the longitudinal tubular frame-bars B B′, the latter by preference secured to the upper faces of the platform-sills in suitable standard-brackets, B^2, secured to said sills and giving the desired angle of inclination to the binder-frame, and the former let into said upper faces, as shown, in order to depress the lower end of the binder-table to the plane of the upper faces of said sills and of the platform-carrier, and to bring it into close proximity to the delivery end of the latter, as shown, to adapt it to receive the grain directly from said carrier. The longitudinal frame-bars B B′ are connected by transverse bars B^3, bolted to them at sufficient distances from each other to form a rigid support for the binder-table D. The tubular bars B B′ project forward over the sill A, and are connected at their ends by a frame-plate, *b*, upon which the gearing for operating the binder is secured, and to which is firmly bolted a double tubular bearing-bracket, C C′ C^2, the lower tube, C′, of which extends beneath the binder-table and supports the needle-shaft H, and the upper tube, C^2, extends above and partly across the binder-table and supports the knotter-actuating shaft E. A foot-plank, A^3, extends parallel with the front sill A, and is connected therewith by a strut or brace, *a*, and is held to the gearing-

brackets by the bars *a'* at a sufficient distance above the ground to serve as a foot-rest for the driver and a support for the float-bar G, which last supports the reel-post F. The float-bar G is securely bolted to the foot-plank A^3, and projects backward to partly overhang the platform. The reel-post F is hinged to the bar G, and may be adjusted forward or backward thereon by any well-known means, and the vertical height of the reel-shaft F' may be adjusted by a reel-shaft bracket, F^2, hinged to the upper end of the reel-post and connected with a hand-lever, F^3, by a rock-shaft, *f*. A breast-plate, I, secured at its lower end to the float-bar G, and connected by a bracket with the knotter-actuating shaft or tubular bracket C^2, serves as an upper shield, and a guard, D', secured at the front end of the binder-table, serves as an end shield, to prevent entanglement of loose grain in passing over the binder-table. The grain end of the platform is provided with a divider, and is supported in the usual way by a grain-wheel, and an endless apron or carrier, J, conveys the grain to the foot of the inclined binder-platform. The inclined platform or table is slotted transversely to permit the passage through it of the needle M and packer-arms K' K', operated from beneath the table in a manner described in another application referred to. Underneath the binder-table and at about the center of its width, or about midway between the inner end of the platform-carrier and the driving-wheel, is the main binder-gear shaft K, journaled in suitable pendent brackets attached to the binder-platform frame. Said shaft is provided with cranks *k k*, through which motion is imparted to the packers K' K', the arrangement being similar to that described in another application referred to, except that by the greater depression given to the inner end of the binder-table, as described, the points *k' k'* of the packers are adapted to reach the grain at a lower level than would otherwise be practicable, and this feature, in connection with the platform rake or carrier, which adapts the latter to carry the grain within the reach of said packers without the interposition of "pickers," so called, or other elevating mechanism, constitutes one of the principal features of my present improvement.

The platform rake or carrier is composed of toothed endless chains *j*, passing around the sprocket-wheels *j' j'*, secured to suitable shafts, J' J^2, mounted in bearings in the platform-sills, one of said shafts, J', being connected with and operated from the main binder-gear shaft in any suitable manner for actuating the sprocket wheels and chains. The platform-frame has a flooring, L, extending underneath the endless chains and protecting the latter with their rake-teeth, hereinafter described, from injury on their outward or return movement, and a second flooring, L', flush, or nearly so, on its upper face with the upper faces of the platform-sills, and upon which grain rests and is carried inward by the endless chains moving over said flooring. This upper flooring, L', extends between the sprocket-wheels *j' j'* in close proximity therewith at its ends, and serves to hold the rake-teeth in operative position on their inward movement, and to prevent sagging of the endless chains. The teeth j^2 of the endless chains *j* are made in angular form, as shown in Figs. 4 and 7, and are mounted in pivots formed on one side of the links of the chain *j*, and, by preference, at or near the rear ends (relatively to the direction of movement) of said links, adapting the latter to hold them down to their work. The angular heel-extensions j^3 of the teeth rest upon the floor L' during the inward operative movement of the teeth, and serve to hold the latter in an upright position for adapting them to act upon the grain and to carry it inward over the flooring L' with them, and when said heel-extension passes off the inner end of the flooring L' the teeth are allowed to drop back and withdraw themselves from the grain, said heel-extension dropping down by the side of the inner sprocket-wheels *j' j'*. By the use of these toothed chains o an equivalent device for forcing the grain inward the grain is carried inward and upward on the inclined binder-table sufficiently far to be brought within the reach of the packer-arms, and the necessity for an intermediate elevating device is avoided.

To hold the grain down and prevent its piling up so high as to roll back on the platform-carrier, I employ what I term a "float," consisting of a curved and slotted or slatted shield, G', hinged at its outer edge to arms *g g*, attached to the longitudinal bar G, forming a support for the reel-post and other parts of the machine, as above referred to. This shield is convex from side to side on its lower face, and where made in a single sheet, as shown, is provided at *g''* with a transverse slot in its inner part, to allow the needle and the points of the packers to pass up through it; but for the purpose of making it light it may be composed of light curved slats suitably secured to a longitudinal bar or bars, in which case the packing and needle arms could pass between the slats. The outer lower side of this shield or float is curved up somewhat to insure the ready passage of the grain under it, and its inner side is upheld at the desired elevation by means of straps *g' g'*, attached at their upper ends to the bar G or other suitable support. These straps may, if desired, be made adjustable in any suitable way for adjusting the height of the float to suit the condition of the grain, and the arms *g g* may be hinged to the bar G, and adjusted thereon by a curved bolt and nut, g^2, that passes through the heel g^3 of the arms, whereby the outer end of the float may be elevated or depressed. Instead of the straps, the inner end of the float may be connected with the bar G by bolts g^4, provided with springs g^5 and adjusting-nuts g^6, as shown in Fig. 6, by which means the inner side of the

float may be adjusted vertically and its elastic pressure varied. The inner end of the float may be bent up to provide space between it and the needle-guard to hold the accumulated grain when the guard is raised.

By the above-described means the float is held up sufficiently to insure the ready admission of the grain under it, and it is adapted to rise and fall with the varying bulk of the grain passing under it. At the same time as the grain is banked upon the inclined binder-table by the action of the platform rake or carrier it is held down upon the table by the float and prevented from falling back on the rake or carrier. The butter N is formed of an endless slotted belt that passes around a roller, n, supported to turn in bearings at the foot of and at right angles to the binder-table, the said roller being driven by gearing n' n^2, shaft n^3, spur-gear n^8, pinion n^9, sprocket-wheel n^4, endless belt n^5, and sprocket-wheel n^6, secured to the main binder-gear shaft K, that receives continuous motion from the drive-wheel O, and the upper end of said butter-belt is supported upon a freely-revolving roller, n^7, secured to the lower roller by top and bottom plates, and is held at any desired angle to the finger-bar by means of a foot-lever, N', arranged to be adjustably locked upon the foot-plank A^3, as shown in Fig. 1, by which means the butter may be adapted to operate upon either long or short grain to direct it properly to the needle-arm and insure the passage of cord around the middle of the bundle. The reel may also be operated continuously through the shaft n^3 from the main binder-gear shaft K. The shaft K may be connected with and driven by the main driving-wheel O through the pinion o, gear o', shaft o^2, sprocket-wheel o^3, chain o^4, and driving-sprocket-wheel o^5, secured to the hub of the main drive-wheel. The rake or carrier may also be driven from the main drive-wheel by an endless belt, J^3, that passes around a sprocket-wheel on the end of the shaft J', and around a sprocket-wheel upon the shaft K, driven by the gear o', above referred to.

It remains to describe the needle-arm, packers, upper compressor, delivery and discharge arms, together with the connections and gearing for operating said devices. The packers K' K' are of well-known construction, suspended at their butt-ends from the binder-frame by yielding links k^2, and pivoted to cranks k k, secured upon opposite sides of the shaft K, and which revolve continuously with said shaft and alternately lift the packers above the surface of the binder-table, with an upward movement, and depress them below the table in their backward movement, whereby one or the other of the arms is continually operating upon the grain on the binder-table to lift and push it up the inclined surface. The movement of the packer-arms is sufficient to carry the grain from the foot of the inclined table to the full extent of the upward movement of the needle and to a point directly beneath the knotter-shaft. The needle M is oscillated at suitable intervals, as hereinafter described, and is secured to the end of a shaft, H, journaled in the sleeve C' below the binder-table, so as to fall beneath its inclined surface, and is provided with a guard, m, that extends from the point of the needle to the lower part of the binder-platform when the needle is raised, and serves to cut off the rising grain from the action of the packers while the bundle is being bound, a sufficient space only being left between the needle-guard and the end of the platform to allow the grain brought forward by the carrier while the needle is raised to be packed beneath the float and held there until the needle is depressed and the packers resume their action upon the grain.

It will be clearly shown in Fig. 4 that the butter does not fairly act upon the grain below the needle-guard when the needle is raised, nor does it act upon the grain above the needle-shaft. The upper compressor, P, is hinged to the knotter-shield or breast-plate I, as shown in Fig. 2, and is formed of two levers, P' P^2, hinged together upon a common shaft, and connected at their upper ends by a screw-bolt and nut, p', with a spiral spring, p^2, interposed between them. The short lever P^2 has a friction-roller, p, secured to its end, which comes in contact with a cam, Q, secured to the knotter-actuating shaft, and which holds the upper compressor to its work while the bundle is being bound, and permits it to swing upwardly from behind the bundle when the latter is delivered from the machine, after which the upper compressor is free to fall, the binding mechanism having been returned to its normal position. The spring-connection between the levers holds the upper compressor firmly against the grain until a sufficient quantity is pressed against it to form a bundle, and it will then yield to allow the longer lever P' to rock a limited distance to start the binding mechanism in operation by the following-described means: A connecting-rod, p^3, is pivoted at one end to the upper end of the lever P', and connected at the other end to a rock-shaft, P^3, that extends to the front of the machine, and operates a trigger-rod, p^4, formed with a shoulder, p^5, that bears beneath a freely-swinging lever, p^6, journaled to the needle-shaft, and connected to an arm on said shaft by means of a spring and hinged link, that presses upon the swinging lever p^6, and serves to hold it down to engage with the arm r of a spring-clutch, secured to the face of a pinion, R, freely journaled upon the main binder-gear shaft K. The end of the shaft K has a cross-bar, r', provided with friction-rollers upon its ends, secured to it to receive a constant rotary motion, and when the lever p^6 is raised by the rod p^4, actuated by the pressure of the grain on the upper compressor, to be disengaged from the spring-clutch, the said clutch will be thrown out to interlock with one of the rollers upon the end of the cross-bar, and will carry the gear-pinion R around

with the shaft K. Intermediate gears, R′ R², transmit motion to the gear-wheel R³ upon the knotter-actuating shaft E. The gear-wheel R³ is connected to the end of the needle-shaft lever H² by a rod, S, to impart to the needle a single vibration at each revolution of the knotter-actuating shaft, and the tripping-lever p^6 will be raised clear of the clutch until the completion of the movement and discharge of the bundle, and will then be depressed by the spring to trip the clutch and permit the gear-shaft K to revolve without actuating the binder mechanism. The knotter-actuating shaft E has a delivery-arm, E′, firmly secured to it, and a guard E², secured thereto, upon the face of the delivery-arm, that will project below the breast-plate as the delivery-arm revolves and press upon the top of the bundle to move said bundle freely from beneath the breast-plate without exerting excessive pressure upon the breast-plate. The delivery-arm will roll the bundle forward within reach of the discharge arm T, pivoted to the upper end of the binder-frame, arranged to fall beneath it and be raised by the depression of the needle to roll or discharge the bundle completely from the machine. The connection between the discharge-arm and needle-arm is made by means of a slotted segment-plate, m', that forms the heel of the needle-arm, and a connecting-rod, t, secured at one end to the discharge arm and held at the other end to have a limited movement in the slotted segment-plate. This slotted segment-plate allows the needle-arm to operate upon the discharge-arm at the latter part of its downward movement and during the first part of its upward movement only, so that the delivery-arm will have had time to carry the bundle forward to the discharge-arm before the latter is operated upon. The upper and front end of the binder-frame extends above the wheel, and is formed with a metal shield, D², that covers the wheel, and is provided at its upper and rear end with a delivery-board, D³, that is inclined both toward the rear and stubble side of the machine, by which means the butts only of the bundle need be lifted to any extent by the discharge-arm, which passes up through an opening in the curved metal shield.

Various changes can be made in some of the devices herein described without departing from my invention. The float may consist, simply, of one or more springs or elastic arms, as shown in Fig. 1 of the drawings. The float or presser bar or bars are suspended far enough over the carrier to press upon the grain effectually to insure its being drawn beyond the point of pressure upon it and into the open space, and with sufficient force to constantly crowd the grain against the needle-guard or into the packers when the needle falls below the platform after its action in tying a bundle. By the joint action of the carrier, float, and butter the grain is moved up the incline sufficiently to throw the same to the packers, when the needle falls below the inclined binder-table and allows the packers to act.

By constructing, arranging, and operating the upper compressor as above described material advantages are gained, as it leaves nothing under the binder-platform, except the packers, needle, and discharge arms. The double levers with an intermediate spring-connection allows a yielding action when there is an excess of pressure against the lever, and accomplishes all that is done by the pressure, compressor-jaws, shafts, and spring-rigging heretofore employed. The compressor, being arranged above the binder-table and bundle, may be operated upon directly by a cam upon the knotter-operating shaft, and is free to swing up, above, or against the breast plate or board, and thus give an entirely free delivery of the bundle.

The devices referred to in the general description above given, and not claimed herein, are more fully described and illustrated in the patents granted to me December 18, 1883, No. 290,459, and No. 276,448, dated April 24, 1883.

Having now described my invention, what I claim as new is—

1. In a grain-binding harvester, an inclined elevating binder-table located on the grain side of the driving-wheel, in combination with packers moving in an elliptical path and operating from beneath said table to move the grain upward thereon, and a platform rake or carrier adapted to deliver the grain directly to said packers without the aid of interposed elevating devices, substantially as described.

2. The combination, with the inclined elevating binder-table, of elliptically-moving packers operating from beneath said table, a platform rake or carrier adapted to deliver the grain directly to said packers, and an oscillating needle also operating from beneath the table and adapted to assist the packers in moving the grain up the incline of the table, and provided with a guard extending to a point below the line of movement of the points of the packers, for causing a separation of the grain near the foot of the incline, substantially as described.

3. In a harvesting-machine, an inclined elevating and binding table arranged on the grain side of the drive-wheel, and a platform-carrier for delivering the grain to said table, in combination with elliptically-moving packers and an oscillating binder-arm operating from beneath to gather, move the grain upward, and pack the same on said table, and a yielding float suspended above said table and overhanging the platform-carrier, substantially as and for the purpose described.

4. The combination of the inclined elevating-table arranged on the grain side of the driving-wheel, the packers operating from beneath said table, the platform rake or carrier for delivering the grain to said packers, and

a yielding float suspended above said binder-table and overhanging the platform-carrier, substantially as and for the purpose described.

5. The combination of the inclined elevating binder-table arranged on the grain side of the driving-wheel, the packers operating from beneath said table, the platform rake or carrier, the float, the oscillating needle operating from beneath the table, and provided with a guard extending nearly to the foot of the inclined table, and the continuously-moving butter extending but slightly below the needle-guard, whereby the operation of the butter upon the rising grain is suspended when the needle is raised, substantially as described.

6. The combination of the inclined elevating binder-table, an oscillating needle, and elliptically-moving packers operating from beneath said table, the knotter-actuating shaft arranged above the table, a compressor suspended from the knotter-support, and means, substantially as described, by which said compressor is operated immediately from the knotter end of the knotter-actuating shaft.

7. The combination of the inclined elevating binder-table, the oscillating needle operating from beneath said table, the compressor pendent from the knotter-support and formed of a rigid and a yielding arm pivoted together, mechanism on the knotter end of the knotter-actuating shaft for positively operating upon said rigid arm, the tripping devices of the knotter-driving mechanism, and connections between said tripping devices and the yielding arm of the compressor, whereby said tripping devices are operated by the pressure of the grain on the pendent compressor, substantially as described.

8. The combination, with the inclined elevating binder-table, of the knotter-actuating shaft arranged above said table, the cam on the knotter-actuating shaft, the compressor suspended from the knotter-support, the connecting-rod, the rock-shaft, the trigger-rod, a spring-clutch, and a pivoted arm operated upon by the trigger-rod to release said clutch and permit the binder mechanism to operate, substantially as described.

9. The combination of the binder-table, the needle-arm, the knotter-shaft, the pendent compressor, and a cam secured to the knotter end of the knotter-actuating shaft, said cam serving to hold the compressor while the bundle is being formed, and permitting it to be raised out of the way for the discharge of the bundle, substantially as described.

10. The combination of the binder-table, the needle-arm, the knotter-actuating shaft, the knotter shield or breast-plate, the rotating discharge-arm, and a guard secured to said arm or knotter-actuating shaft and moving below the breast-plate in advance of the discharging arm for relieving the breast-plate of the pressure of the bundle, substantially as described.

11. The combination of the binder-table, an oscillating needle operating from beneath the table, an ejector or discharge arm pivoted to fall below the table, and mechanism connecting the ejector with the needle, whereby said ejector is actuated by said needle at or near the ends of the throw of the latter, substantially as described.

12. The combination of the binder-table, an oscillating needle operating from beneath said table, the knotter-actuating shaft, the rotating discharge-arm, a secondary discharge-arm, and means connecting the latter with the needle, whereby said secondary discharge-arm is operated during the latter part of the movement of the needle, substantially as and for the purpose described.

13. In a grain-binding harvester, the combination of a horizontal grain-platform, the side-delivery carrier thereof, an inclined elevating binder-table arranged to receive the grain from said carrier, the elliptically-moving packers and vibrating needle operating from beneath said table, and a yielding float curved on its lower face, arranged above said table and overhanging the carrier, substantially as described, whereby it is adapted to engage the grain thereon, and to assist in moving it inward to and upward on the inclined binder-table.

14. In a grain-binding harvester, the combination of a horizontal grain-platform, the side-delivery carrier thereof, an inclined elevating binder-table arranged to receive the grain from the carrier, elliptically-moving packers and a vibrating needle operating from beneath to move the grain upward on said table, and a yielding float arranged above said table and overhanging the platform-carrier sufficiently to engage the moving grain thereon, and to assist in moving it inward to and upward on the inclined binder-table to the packers and needle, substantially as described.

In testimony whereof I have hereunto set my hand this 23d day of April, A. D. 1883.

LEWIS MILLER.

Witnesses:
N. N. LECHNER,
J. LEET YOUNG.