(No Model.) 7 Sheets—Sheet 1.

D. STRUNK.

LOW DOWN GRAIN BINDING HARVESTER.

No. 379,830. Patented Mar. 20, 1888.

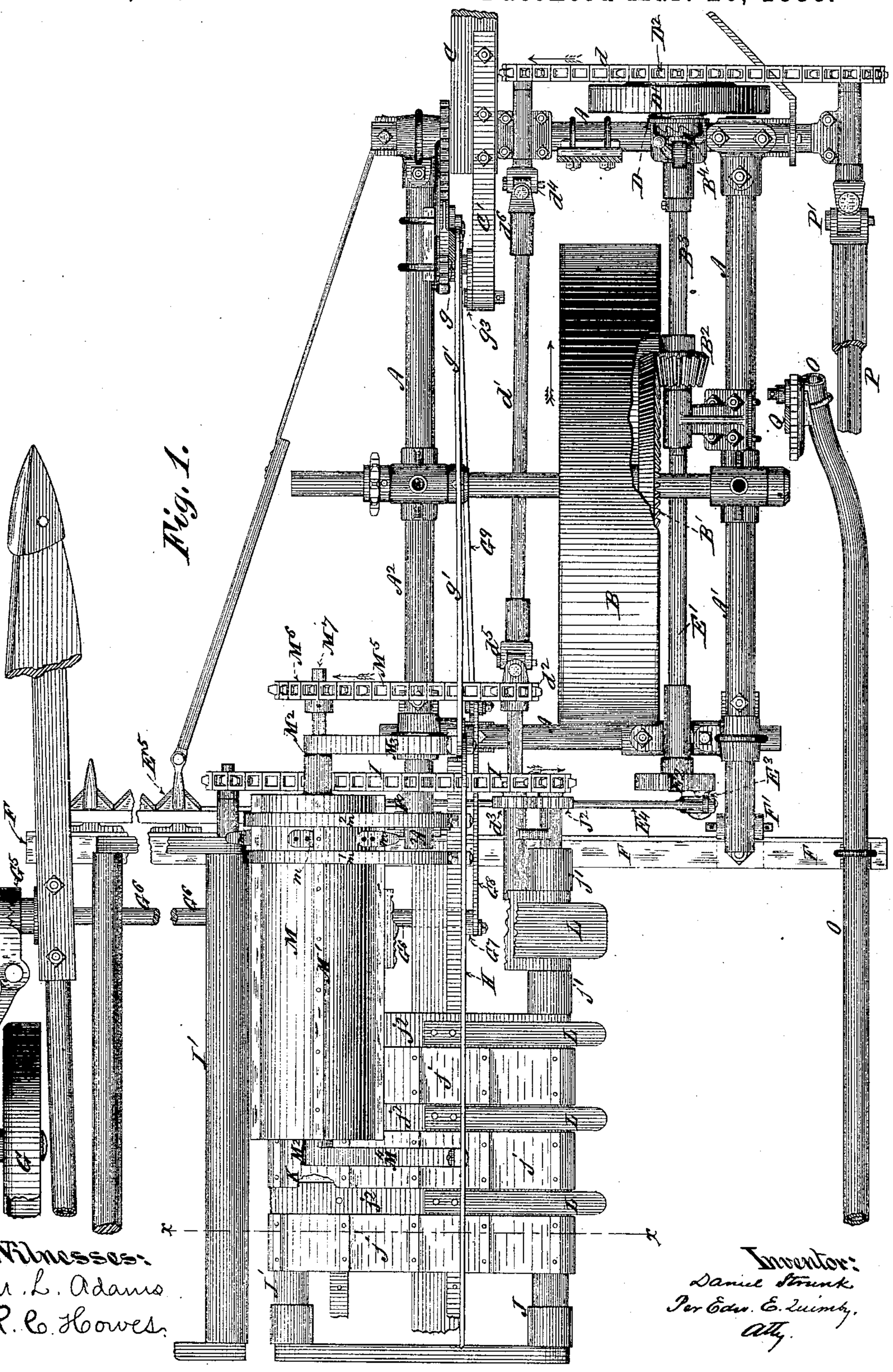

Fig. 1.

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Inventor:
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(No Model.) 7 Sheets—Sheet 2.

D. STRUNK.

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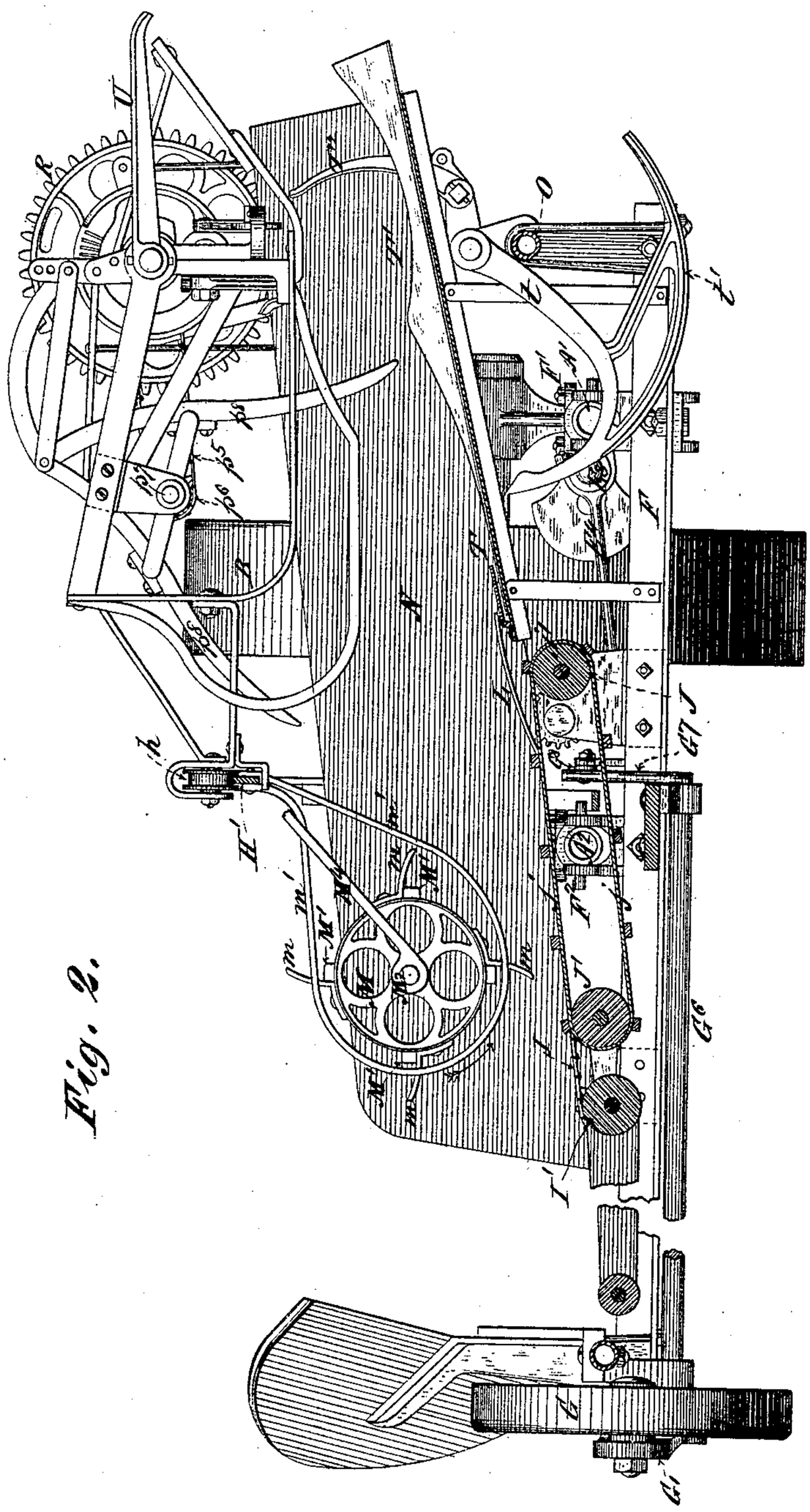

Fig. 2.

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(No Model.) 7 Sheets—Sheet 3.

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LOW DOWN GRAIN BINDING HARVESTER.

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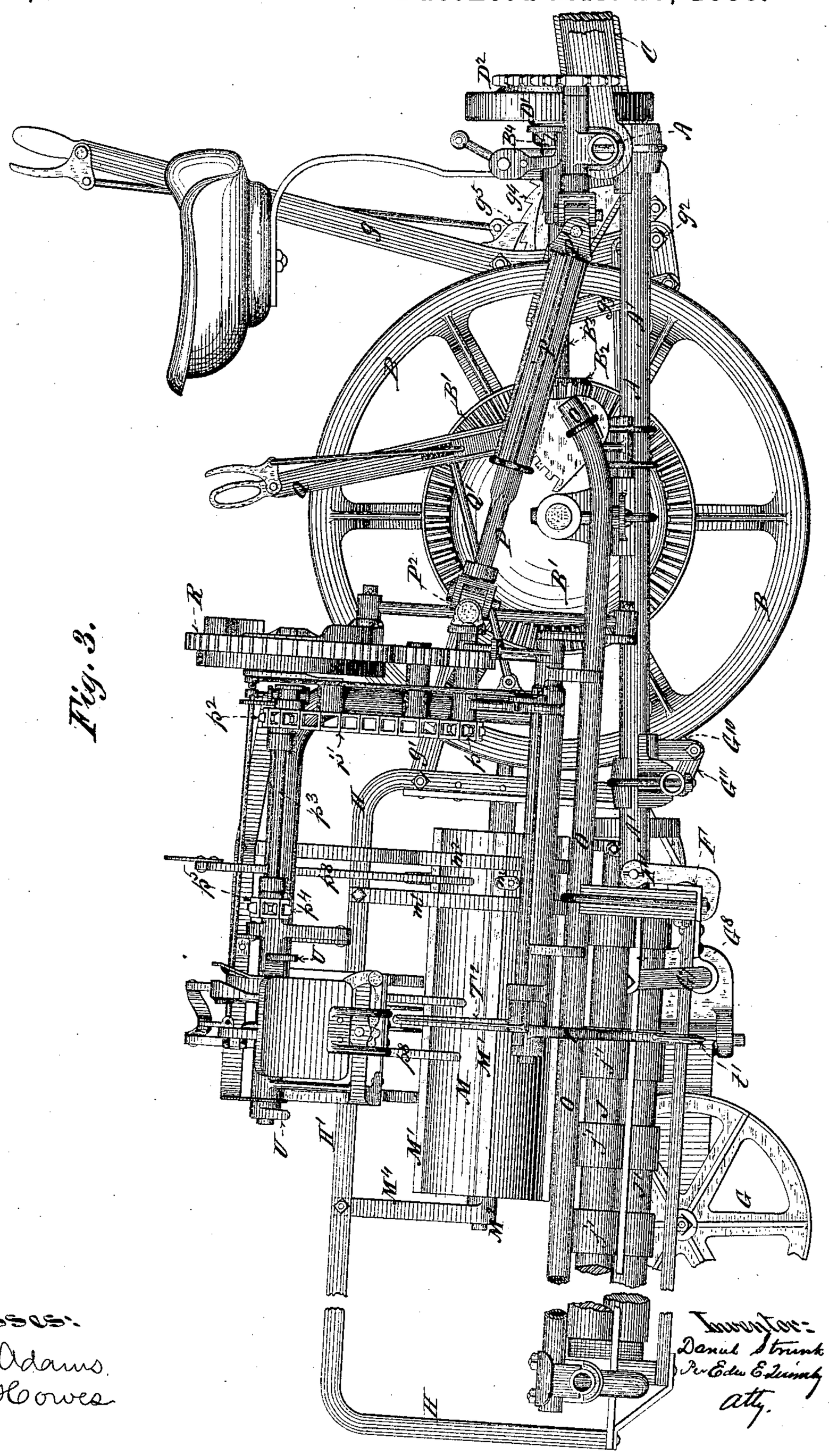

Fig. 3.

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(No Model.) 7 Sheets—Sheet 4.

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LOW DOWN GRAIN BINDING HARVESTER.

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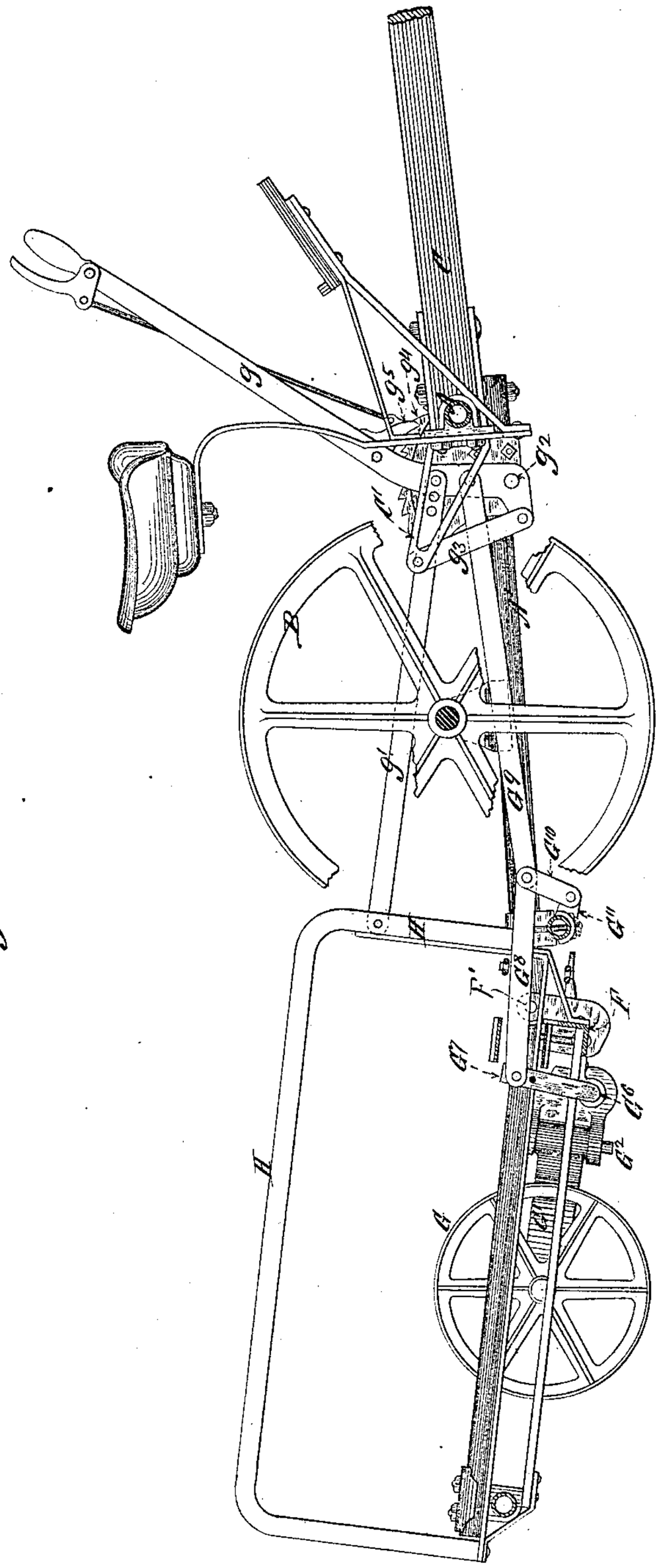

Fig. 4.

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(No Model.) 7 Sheets—Sheet 5.

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LOW DOWN GRAIN BINDING HARVESTER.

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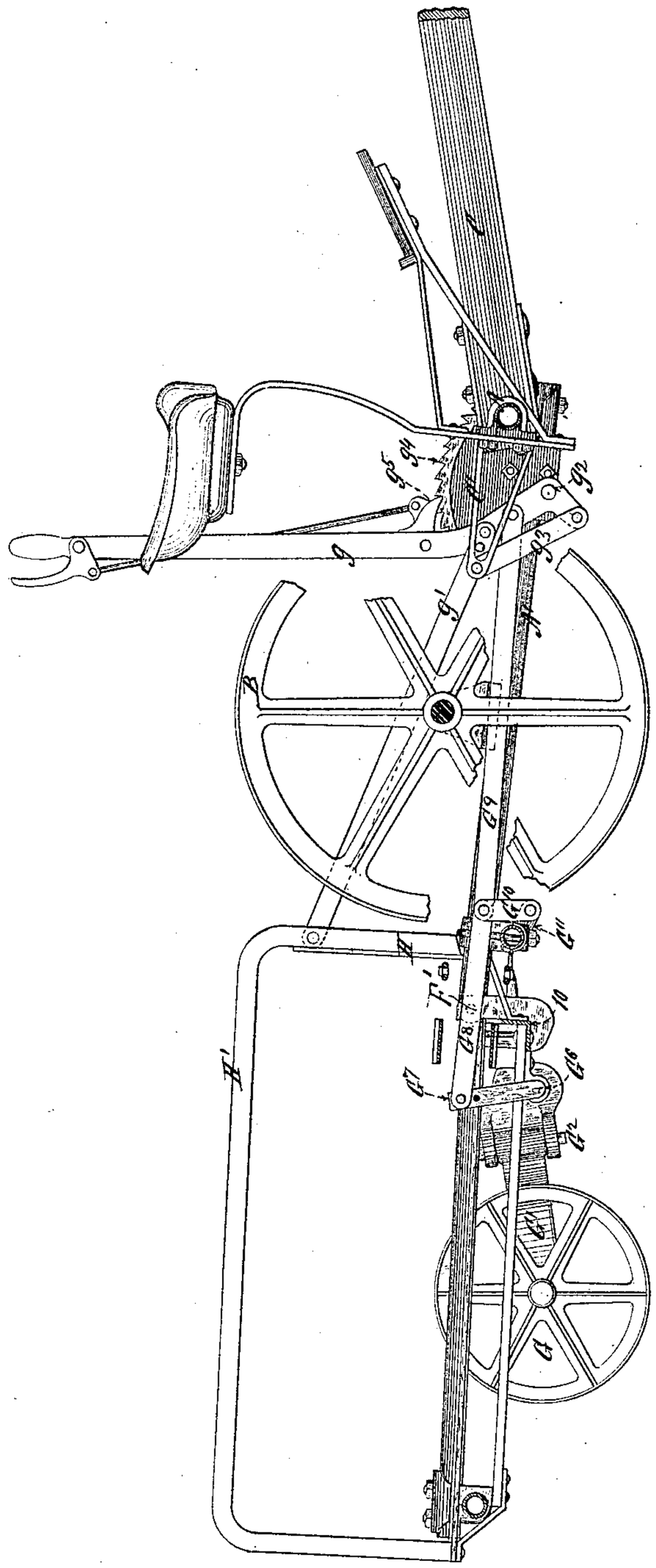

Fig. 5.

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(No Model.) 7 Sheets—Sheet 6.

D. STRUNK.

LOW DOWN GRAIN BINDING HARVESTER.

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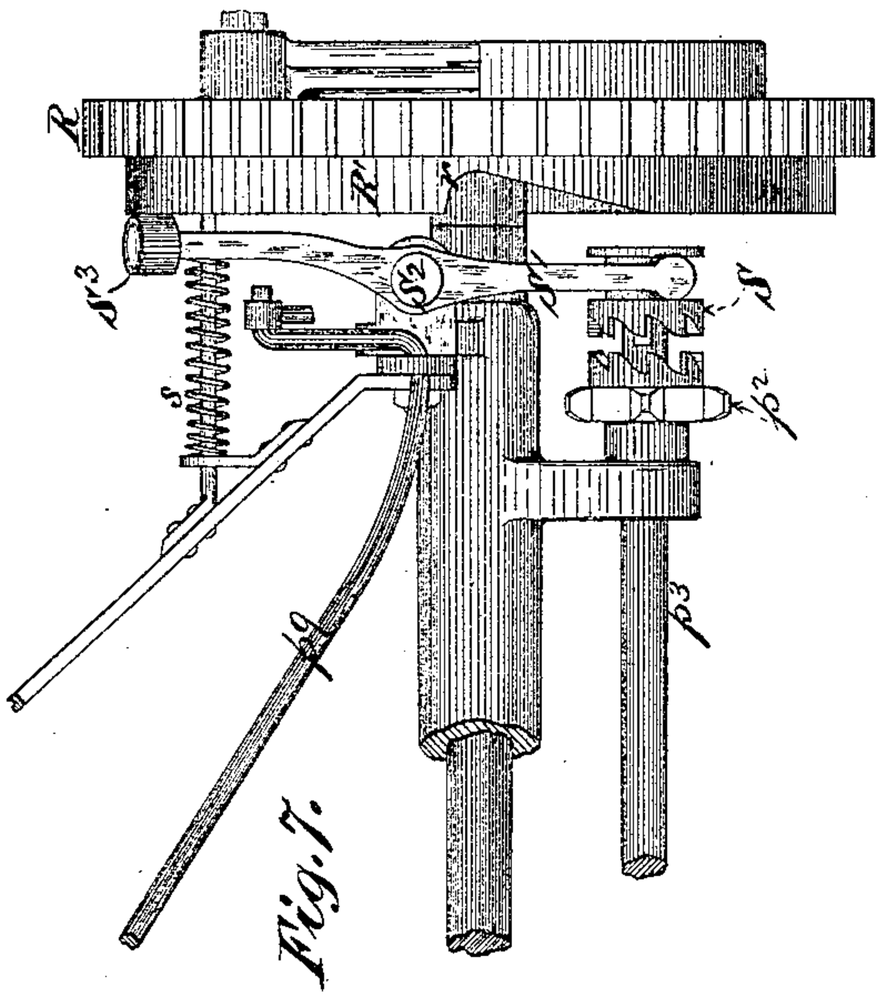

Fig. 7.

Fig. 6.

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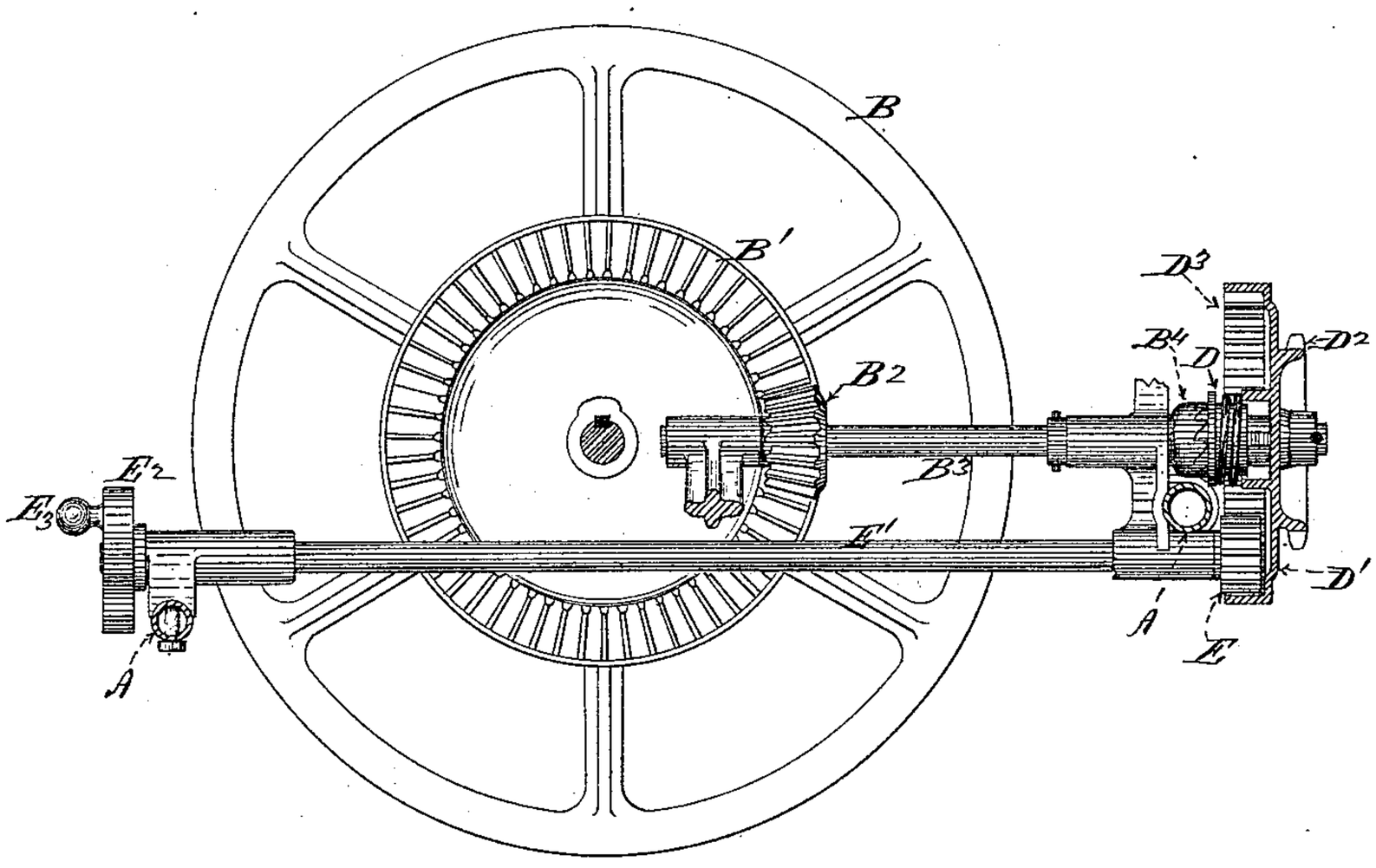
(No Model.) 7 Sheets—Sheet 7.

D. STRUNK.

LOW DOWN GRAIN BINDING HARVESTER.

No. 379,830. Patented Mar. 20, 1888.

Fig. 8.



Witnesses:
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R. C. Howes.

Inventor:
Daniel Strunk.
Per Edw. E. Lunsby.
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UNITED STATES PATENT OFFICE.

DANIEL STRUNK, OF MINNEAPOLIS, MINNESOTA, ASSIGNOR OF TWO-THIRDS TO THE MINNEAPOLIS HARVESTER WORKS, OF SAME PLACE.

LOW-DOWN GRAIN-BINDING HARVESTER.

SPECIFICATION forming part of Letters Patent No. 379,830, dated March 20, 1888.

Application filed February 27, 1886. Serial No. 193,406. (No model.)

To all whom it may concern:

Be it known that I, DANIEL STRUNK, of Minneapolis, Minnesota, have invented certain Improvements in Low-Down Grain-Binding Harvesters, of which the following is a specification.

In the machine embodying my improvements, which is illustrated in the accompanying drawings, one of the more valuable features is the general plan of organization, whereby a rear-cut machine in which there is a direct and easy delivery of the grain from the platform to a low-down binder is balanced on two wheels—to wit, the drive-wheel, which is mounted in the main frame in front of the front sill of the platform near the stubble side of the machine, and a caster-wheel mounted in the rearwardly-projecting end of an arm pivotally connected to the grain side of the platform. The balancing of the machine on two wheels is effected by transmitting power from the drive-wheel to a system of distributing-gearing supported upon the main frame in front of the drive-wheel. The pole, the driver's seat, and the adjusting-lever, &c., for raising and lowering the sickle by tilting the machine are also supported upon the front portion of the main frame. The binder is located on the outside of the plane of the drive-wheel on the stubble side of the machine. The gearing and heavier parts of the binder are located well forward toward the axis of the drive-wheel, and thus materially assist in counterbalancing the weight of the platform. By this organization of the machine the drive-wheel is made to carry all the weight of the machine, excepting what is necessary to hold the platform down when the machine is being operated upon an inclined surface. There is no mere dead-weight added to the forward part of the machine merely for the sake of counterbalancing the platform; but the necessary parts of the machine are so placed that the center of gravity is near the drive-wheel at a point which is on a line between the drive-wheel and the caster-wheel.

The accompanying drawings, illustrating a low-down grain-binding harvester embodying my improvements, are as follows:

Figure 1 is a top view with the binder omitted. Fig. 2 is a vertical section through the line *x x* on Fig. 1, affording a rear view of the binder, &c. Fig. 3 is an elevation of the stubble side of the machine. Figs. 4 and 5 are vertical sections taken through the line *y y* on Fig. 1, with the binder and several other parts omitted for the purpose of more clearly exhibiting in elevation the operation of the devices for changing the height of cut. Figs. 6 and 7 are top views of portions of the binder, illustrating the devices for stopping and starting the packers. Fig. 8 is an elevation, partly in section, exhibiting the stubble side of the drive-wheel and the gearing for transmitting power therefrom.

The main frame A of the harvester surrounds the drive-wheel B. The pole C is hinged to the front of the main frame by having the pipe of which the frame is made passed through it, or by any other suitable means. The drive-wheel has affixed to its stubble side the bevel-wheel B′, which drives the pinion B^2, affixed to the horizontal counter-shaft B^3. The counter-shaft B^3 has affixed to it the clutch-half B^4, the ratchet-teeth of which are adapted to engage the teeth of the adjustable clutch-half D, feathered upon the hollow hub of the distributing-gear D′. The latter is mounted loosely upon the forward end of the shaft B^3, and by means of the clutch D may be made to partake of the motion of the said shaft.

The distributing-gear D′ upon its front side is provided with the sprocket-teeth D^2 and has its rim provided with the internal teeth, D^3. The latter engage and drive the pinion E, affixed to the forward end of the horizontal crank-shaft E′, having affixed to its rear end the crank-head E^2, provided with the ball-crank pin E^3, for engaging the pitman E^4, which connects the crank-head with sickle E^5.

The finger-bar F constitutes the front horizontal member of the platform-frame and has two hinged connections, F′ and F^2, with the rear ends, respectively, of the two side members, A′ and A^2, of the main frame.

The grain side of the platform is supported upon the caster-wheel G, mounted in the rear end of the arm G′, having the usual hinged connection, G^2, at its forward end with the ratchet-plate G^3, which is clamped by means of the nut G^4 against the face of the crown-wheel or rosette G^5, affixed to the grain end of the rock-shaft G^6, mounted in suitable bearings and extending horizontally beneath the platform-

conveyer toward the stubble side of the machine.

The rock-shaft G^6 is provided upon its stubble end with the crank-arm G^7, and by means of the two links G^8 and G^9 is connected with the lever *g*. The lever *g* is connected by means of the connecting-rod *g'* with the upper part of the inverted-U-shaped standard H, which constitutes a portion of the platform-frame and serves to support various parts of the mechanism of the machine. At its forward end the connecting-rod *g'* is provided with a series of holes, by means of which the distance between its pivotal connection with the lever and with the standard H may be varied for the purpose of varying the normal tilt of the platform. At its lower end the lever *g* is in the form of a bell-crank lever, having its axis upon the pivot g^2, and the shorter arm of this lever is connected by the pitman g^3 with a rearward extension, C', bolted to the rear end of the pole C.

The lever *g* is the actuating-lever for operating the tilting mechanism and varying the height of the cut. It is held in the position to which it may have been adjusted by the usual ratchet, g^4, and pawl g^5.

The operation of the raising and lowering mechanism is as follows: Referring to Fig. 4, where the machine is shown at a low cut, it will be seen that by swaying the hand-lever *g* backward upon its pivot g^2 the extension C' of the pole C will be carried downward by being connected through the pitman or link g^3 to the short arm of the hand-lever *g*. This movement carries the forward part of the main frame downward by flexing the joint whereby the pole C is hinged to the frame. As the forward part of the main frame rocks downward on the axle of the drive-wheel, there must be a concurrent upward movement of the rear portion thereof, to which the cutting apparatus and platform are jointed at F', Fig. 1. Concurrently with this upward movement of the cutting apparatus and grain-platform at the stubble side is an equal upward movement at the grain side thereof, produced as follows: When the hand-lever *g* is swayed backward, as just explained, the crank-arm G^7 of the rock-shaft G^6 is also swayed backward through the connecting-links G^8 and G^9, which connect it to the lever *g*. The rearwardly-extending arm G', at the rear end of which the grain-wheel G is mounted, being fixed to the grain end of the rock-shaft G^6, would be swayed downward concurrently with the backward movement of the crank-arm G^7. This, however, being prevented by the grain-wheel G bearing upon the ground, there would be a resulting upward movement of the rock-shaft G^6, carrying therewith the grain side of the cutting apparatus and grain-platform, when the machine would occupy the position shown in Fig. 5. The connecting-rod *g'* is attached at its forward end to the lever *g* in such relation to the pivot g^2 and at its rear end to the standard H in such relation to the joint F that an approximately horizontal position of the grain-platform is secured during the vertical movement thereof.

The links G^8 and G^9, where they are pivoted to each other, are also pivoted to the upper end of a radius-bar, G^{10}, the lower end of which is pivoted to the fixed arm G^{11}, projecting from a part of the main frame. The object of this radius-bar is to confine the link G^8 during its forward and backward movements to a path in which it will not interfere with the sprocket-chain I, which drives the platform-canvas roller I', nor with the forward one of the intermediate endless conveyers which are stretched over the roller-shafts J and J'.

Figs. 4 and 5 are especially intended to show the mode of operation of the platform-tilting mechanism, and respectively represent the various parts of it in two different positions.

The parallel intermediate conveyers, *j j j*, &c., are driven by rollers *j' j' j'*, &c. These rollers are enlarged portions of the shafts J J', and are less wide than the conveyers *j j*, &c.

The spaces between the rollers *j' j'*, &c., are filled by the decking-strips j^2 j^2 j^2, &c., and the intermediate conveyers are thus made, respectively, to overlap the edges of the interposed decking-strips, as illustrated in Fig. 1, in which a portion of the edge K of one of the intermediate conveyers is represented as broken out, and a view is thus afforded of the edge of the decking-strip beneath it.

Stripping-fingers L L L, &c., are affixed to the decking-strips j^2 j^2 j^2, respectively, and extend therefrom over the edge of the binder-deck across the gap between the binder-table and the intermediate conveyers. By this construction, and especially by the overlapping of the intermediate conveyers upon the edges, respectively, of the decking-strips j^2 j^2 j^2, the grain is easily and effectually conveyed to the binder-table and the straws are prevented from getting caught upon the rollers which drive the intermediate conveyers.

The overrunning roller or cylinder M, provided with bars or slats M', is mounted in bearings M^2, formed in the lower ends of the inclined arms M^3 and M^4, bolted at their upper ends to the standard H. Near its front end the cylinder M is provided with the projecting butt-hastening teeth *m*. The butt-hastening teeth are prevented from carrying grain or straw around with them in their revolution by means of the stripping-guards *m'* and m^2, bolted to the standard H.

The platform-canvas, the intermediate conveyers, and the overrunning cylinder are driven from the main driving-sprocket D^2 by means of the sprocket-chain *d*, which drives the tumbling-shaft *d'*, provided with the sprocket-wheel d^2, from which motion is transmitted by means of the sprocket-chain M^5 to the sprocket-wheel M^6, affixed to the front end of the shaft M^7 of the overrunning cylinder M. The knuckle-shaft *d'* is also provided with

the spur-wheel d^3, which drives the pinion J^2, affixed to the forward end of the intermediate conveyer-driving roller, J, which is also provided with a sprocket-wheel, from which power is taken by means of the sprocket-chain I to drive the platform-canvas roller I', previously referred to.

The section of the shaft d' between the two knuckle-joints d^4 and d^5 has its forward end squared and inserted loosely in a square recess formed in the member d^6 of the forward knuckle-joint, so that it may have a sliding connection therewith for self-adjustment when the machine is being tilted.

The machine is provided with the usual butt-board, N, along which the butts of the grain pass on their way to the binder.

The binder is adjustably supported upon the horizontal member O of the platform-frame on the stubble side of the machine and upon the horizontal portion H' of the standard H, the roller h being provided, as shown in Fig. 2, for diminishing the friction upon the top of the standard H when the binder is being adjusted.

Power is transmitted to drive the binder from the knuckle-shaft P, the forward end of which is provided with a sprocket-wheel which engages the main driving sprocket-chain d. The knuckle-shaft P, between the two knuckle-joints P' and P^2, is composed of two sections, which rotate together, but which are telescopically jointed to permit the knuckle-shaft to lengthen or shorten itself when the binder is being adjusted.

The adjustment of the binder is effected by swaying the lever Q, which is pivoted to the forward end, O, of the main frame and connected by the link Q' with the binder-frame, as shown.

The main gear R of the binder is driven from the continuously-running shaft P, and is tripped into gear and also stopped at the completion of its revolution, or after binding a bundle, in the manner which is common to machines of the well-known Appleby type.

The rear end of the knuckle-shaft P carries the sprocket-wheel p, for engaging the sprocket-chain p', which drives the sprocket-wheel p^2, mounted loosely upon the forward end of the shaft p^3, having its bearings on the main frame of the binder, as shown in Figs. 3 and 6. The rear end of the shaft p^3 carries the sprocket-wheel p^4, for engaging the sprocket-chain p^5, which drives the sprocket-wheel p^6 on the packer-shaft p^7, carrying the packer-arms p^8. The crooked arm p^9 serves to connect the packers with the tripping mechanism in the usual manner. The devices for stopping and starting the packers, however, differ somewhat from those heretofore employed for this purpose. On reference to the drawings it will be seen that a clutch, S, provided with ratchet crown-teeth adapted to engage similar teeth on the side of the sprocket-wheel p^2, is made to slide on a feather on the forward end of the shaft p^3. A lever, S', rocking upon the pivot S^2, affixed to the main frame of the binder, is provided at its grain end with a roller, S^3, and has at its opposite end a fork which engages with the circumferential groove formed in the periphery of the clutch S. An expanding spiral spring, s, exerts its thrust against the grain end of the lever S' and acts to hold the roller S^3 against the edge of the annular projection or cam R', extending around the rear face of the main gear R and provided with the recess r. By the seating of the roller S^3 in the recess r when the main gear completes its revolution the clutch S is driven into engagement with the ratchet-teeth upon the side of the sprocket-wheel p^2, and the shaft p^3 is thus made to partake of the rotatory movement of the sprocket-wheel p^2, and hence to actuate the packers.

The binder-table T has a slightly steeper inclination than the inclination of the intermediate conveyers, and is elevated sufficiently to allow suitable clearance for the binder-arm t, provided with the usual guard, t', the axis of which is beneath the binder-table.

The gavel-receptacle T' is made of concave shape, and thereby more readily retains loose grain pushed into the gavel-receptacle by the packers, and also insures a greater range of action of the discharge-arms U U when they are acting to discharge the bound bundle, because the curvature of the gavel-receptacle T' conforms nearly to the paths of movement of the ends of the discharge-arms.

The compressor or stop T^2, against which the packers force the grain during the operation of forming the gavel, is tripped out of the way to permit the discharge of the bound bundle and returned to its normal position by the well-known means employed in the Appleby binder.

In operation the cut grain falls upon the platform-conveyer and is carried in the usual way to the point where the platform-canvas returns over the driving-roller I'. From this point it is taken by the intermediate conveyers, j j j, &c., and the sprocket-chain I and carried to the binder-table T. The overrunning cylinder M rolls down grain which might otherwise lie too loosely upon the intermediate conveyers to be moved properly after coming in contact with the butt-board N, and, in conjunction with the intermediate conveyers, forces the grain forward. The butt-hastening teeth m m m, &c., insure a positive forward movement of the butts of the grain, which movement continues after the central portions of the stalks have been arrested by collision with the needle-guard t' during the binding of the bundle. By the operation of the intermediate conveyers and the overrunning cylinder the grain is carried within the range of action of the packer-arms and by them is packed into the gavel-receptacle against the compressor T^2 until, when enough grain has accumulated for a bundle, the packers, yielding to the accumulated mass, trip the binder into gear and the bundle is bound.

In its normal condition the binder (except the packers) is at rest, waiting for a bundle, and its parts are in theposition shown in Fig. 1, the roller S^3 being then seated in the recess *r* of the cam R′.

When the binder is tripped into gear, the main binder gear R starts forward. The cam R′ forces back the roller S^3, thus vibrating the lever S′ and disengaging the clutch S from the sprocket-wheel p^2, thereby permitting the sprocket-wheel p^2 to run loosely on the shaft. This stops the packers and the parts are left in the position in which they are shown in Fig. 2, wherein the main binder-gear R is represented as having nearly completed its revolution.

I claim as my invention—

1. In a two-wheeled harvester and binder, a main frame inclosing the drive-wheel and pivotally connected at its rear end to the platform, a caster-wheel mounted in an arm pivotally connected with the platform, a low-down binder-table, binder-mechanism, and its driving-gearing in the rear of the drive-wheel, a pole hinged to the front of the main frame, and a system of distributing-gearing mounted on the main frame in front of the drive-wheel, a counter-shaft transmitting motion forward from the main wheel to said system, and connections leading backward therefrom to the platform behind the main frame for transmitting power to actuate the sickle, the conveyers, and the binder-gearing, whereby the entire machine is balanced upon two wheels and has its center of gravity near the drive-wheel and in a line between it and the caster-wheel.

2. In a rear-cut grain-binding harvester, the combination of a main frame inclosing a drive-wheel upon the axle of which it is mounted, a system of distributing-gearing mounted on the main frame in front of the drive-wheel, a counter-shaft transmitting motion forward from the main wheel to said system and connections leading backward therefrom to the platform behind the main frame for transmitting power to all the operative parts of the machine except the reel, a pole hinged to said frame in front, a sway-bar or hand-lever mounted thereon near the forward part thereof and connected to the pole in a manner to flex the said hinge by a movement of the hand-lever, a grain-platform and cutting apparatus hinged to the main frame at the rear of the main frame, a binder mounted on the grain-platform on the outside of the plane of the drive-wheel, a rock-shaft mounted in suitable bearings in said platform and extending from the grain toward the stubble side thereof, a grain-wheel mounted upon a rearwardly-extending arm of said rock-shaft, and suitable connections between the stubble end of said rock-shaft and a hand-lever, whereby the entire grain platform and binder may be raised and lowered by the hand-lever.

3. In a rear-cut grain-binding harvester, the combination of a main frame inclosing a drive-wheel upon the axle of which it is mounted, a main driving gear-wheel mounted upon the same axle, a pinion driven by the main gear-wheel, a counter-shaft to which the pinion is attached, extending forward to a point on the main frame in advance of the drive-wheel, a system of gearing mounted upon the main frame in advance of the drive-wheel, actuated by said counter-shaft, and serving to distribute power to all the operative parts of the machine except the reel, a pole hinged to the main frame in front, a sway-bar or hand-lever mounted on the main frame near the forward part thereof and connected to the pole in a manner to flex the said hinge by a movement of the sway-bar, a grain-platform hinged to the main frame at the rear, formed and strengthened by having an inverted-U-shaped standard connecting the front and rear thereof, the sill or frame-piece forming the stubble side of the grain-platform, extending forward from the hinge-joint of said platform at the stubble side of the drive-wheel, a binder adjustably mounted upon said sill, a rock-shaft mounted in suitable bearings on said platform and extending from the grain toward the stubble side thereof, a grain-wheel mounted upon a rearwardly-extending arm of said rock-shaft at the grain end thereof, and suitable mechanism connecting the stubble-end of said rock-shaft to the sway-bar, whereby the entire grain-platform, with cutting apparatus and binder, may be raised and lowered by the movement of the sway-bar.

4. In a rear-cut grain-binding harvester, the combination of a main frame inclosing a drive-wheel upon the axle of which it is mounted, a main driving gear-wheel mounted upon the same axle, a pinion driven by the main gear-wheel, a counter-shaft to which the pinion is attached, extending forward to a point on the main frame in advance of the drive-wheel, a system of gearing mounted upon the main frame in advance of the drive-wheel, actuated by the said counter-shaft, and serving to distribute power to all the operative parts of the machine except the reel, a pole hinged to the main frame in front, a hand-lever mounted on the main frame near the forward part thereof and connected to the pole in a manner to flex the said hinge by a movement of the sway-bar, a grain-platform hinged to the main frame at the rear, formed and strengthened by having an inverted-U shaped standard connecting the front and rear thereof, a suitable connection between the U-shaped standard of the grain-platform and the sway-bar or hand-lever to maintain an approximately-horizontal position of the said grain-platform, the sill or frame-piece forming the stubble side of the grain-platform, extending forward from the hinge-joint of said platform at the stubble side of the drive-wheel, a binder adjustably mounted upon said sill, an adjusting-lever mounted also upon the forward end of said sill in advance of the binder, a rod or link connecting said lever with the binder, whereby the latter may be adjusted forward and backward upon said sill by said lever, a rock-shaft mounted in suitable

bearings on said platform and extending from the grain toward the stubble side thereof, a grain-wheel mounted upon a rearwardly-extending arm of said rock-shaft at the grain end thereof, and suitable mechanism connecting the stubble end of said rock-shaft to the sway-bar, whereby the entire grain-platform, with cutting apparatus and binder, may be raised and lowered by the movement of the sway-bar.

5. In a rear-cut grain-binding harvester, the combination of the main frame A, supported by the drive-wheel B, the pole C, hinged to the main frame and having the extension C′, the finger-bar F, forming a part of the grain-platform, hinged to the main frame in rear of the drive-wheel, the standard H, forming part of the platform-frame, the rock-shaft G^6, mounted on the platform and having the rearwardly-extending arm G′, the grain-wheel G, mounted thereon, the crank-arm G^7 at the stubble end of the rock-shaft, the links G^8 and G^9, radius-bar G^{10}, sway-bar *g*, connecting-rod *g′*, and pitman g^3, substantially as and for the purpose described.

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