(No Model.) 5 Sheets—Sheet 1.

A. STARK.

GRAIN HARVESTER.

No. 372,339. Patented Nov. 1, 1887.

Fig. 1.

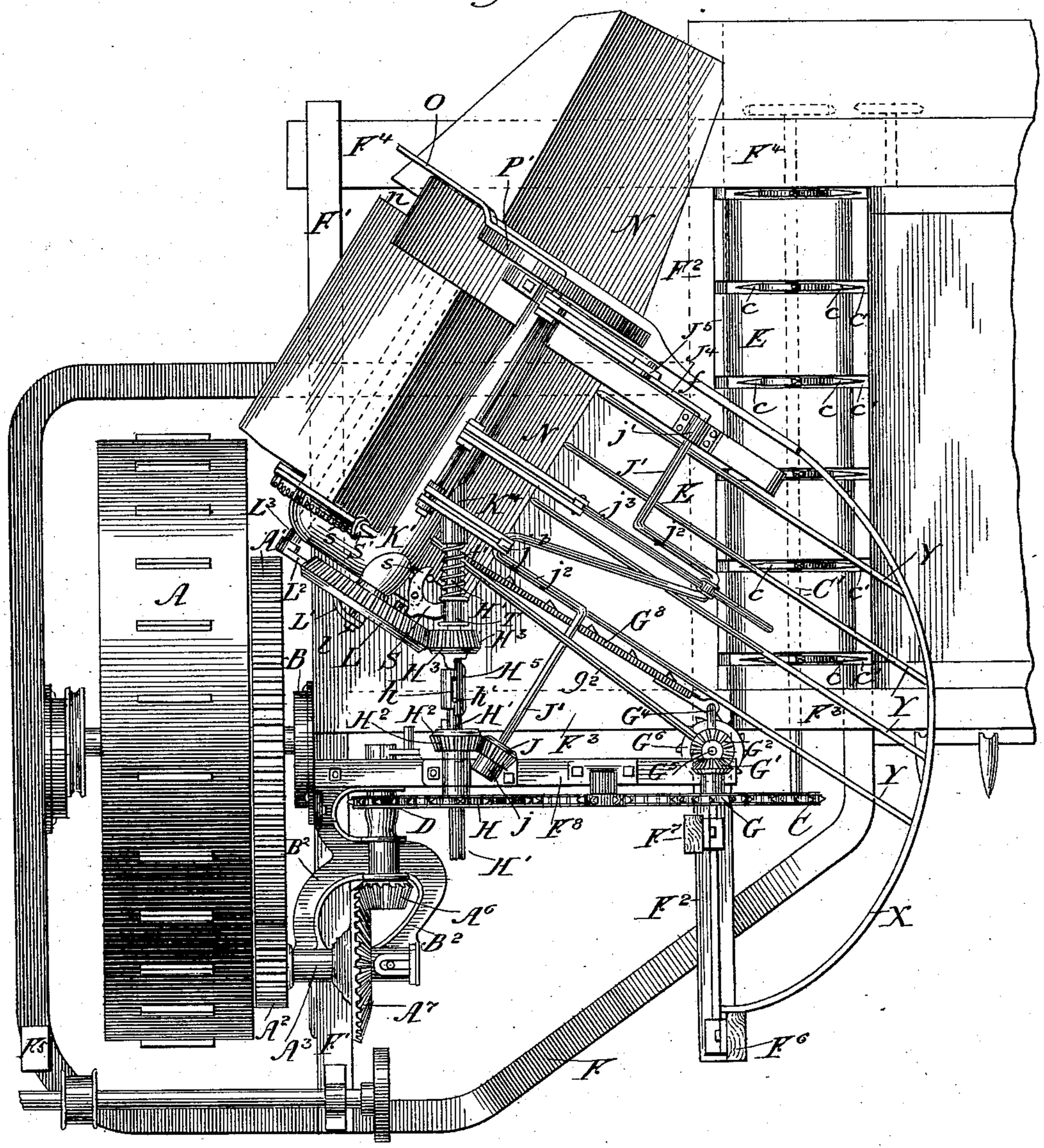

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Fig. 3.

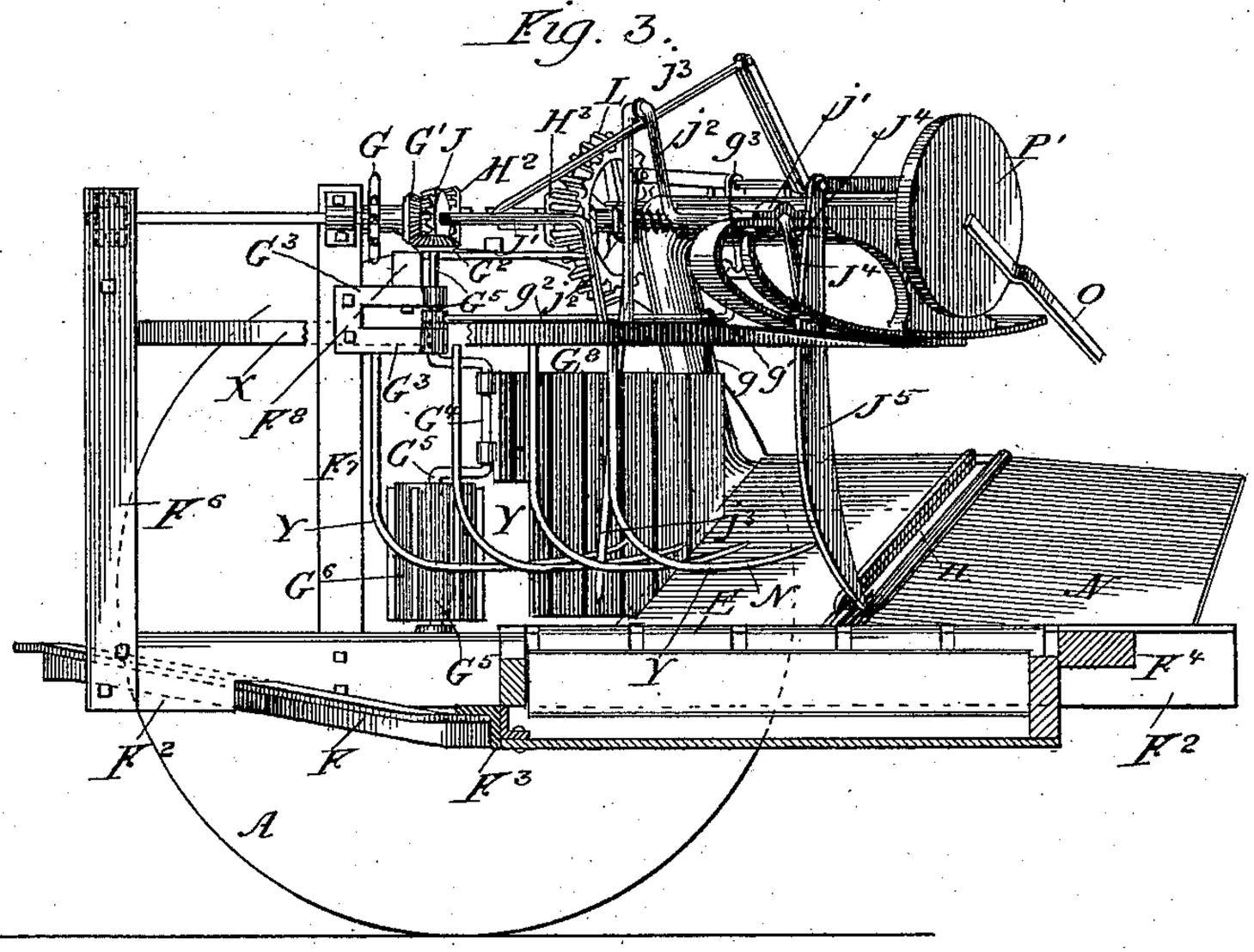
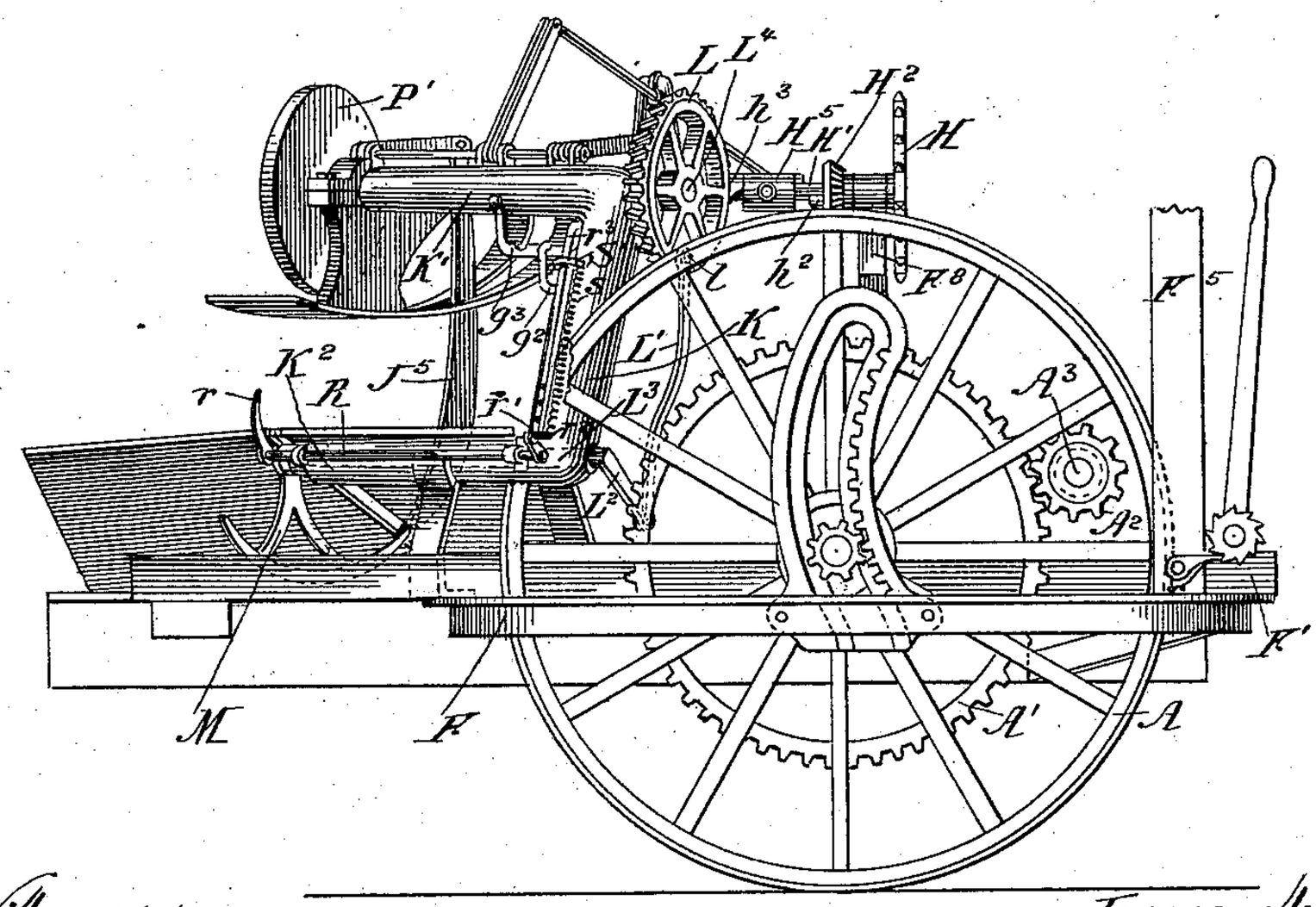


Fig. 2.



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(No Model.) 5 Sheets—Sheet 3.

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GRAIN HARVESTER.

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Fig. 4.

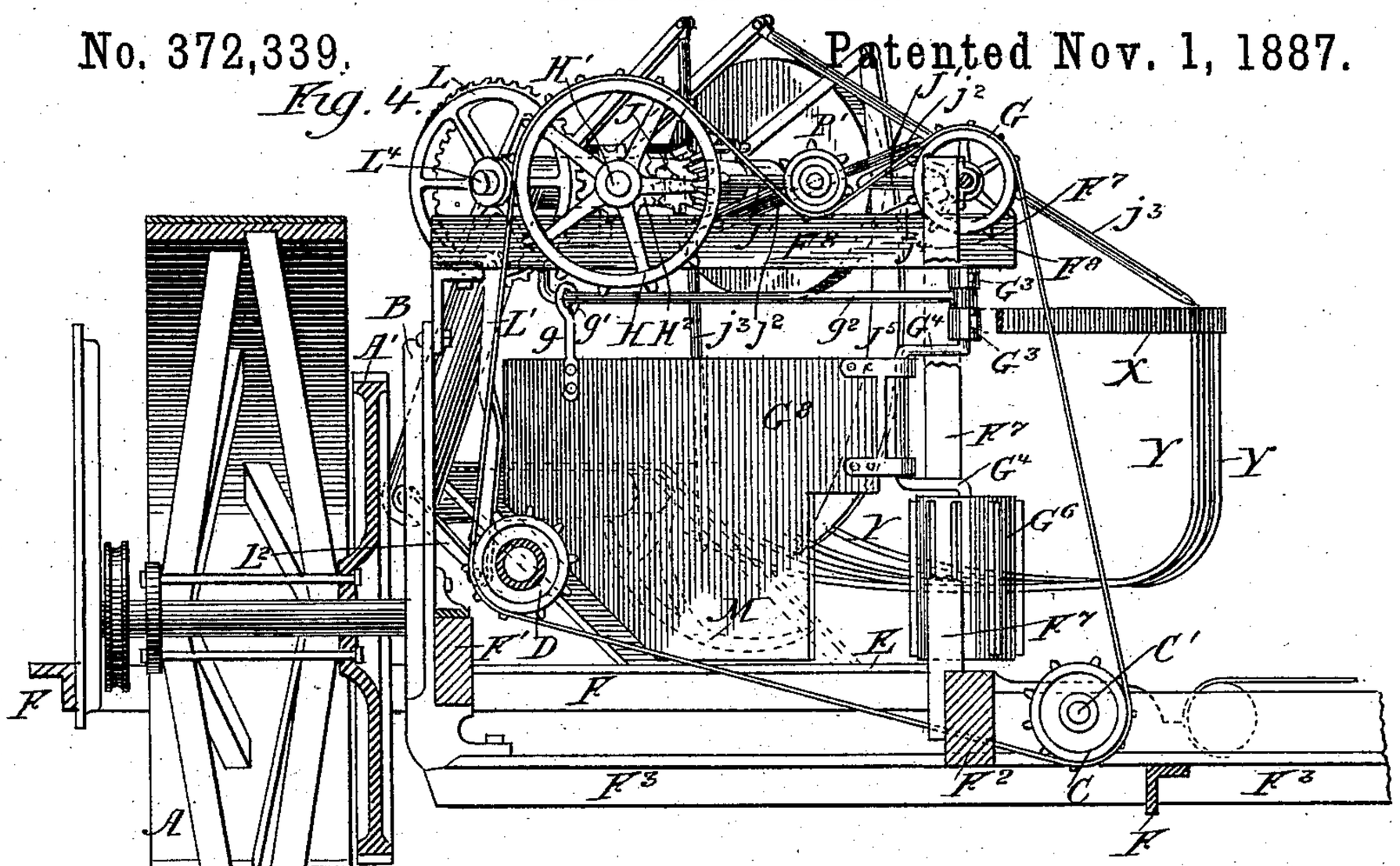


Fig. 5.

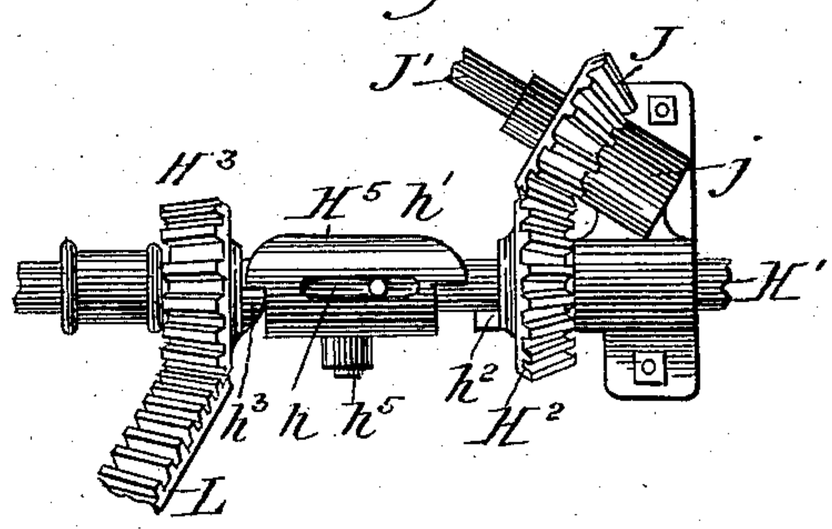


Fig. 6.

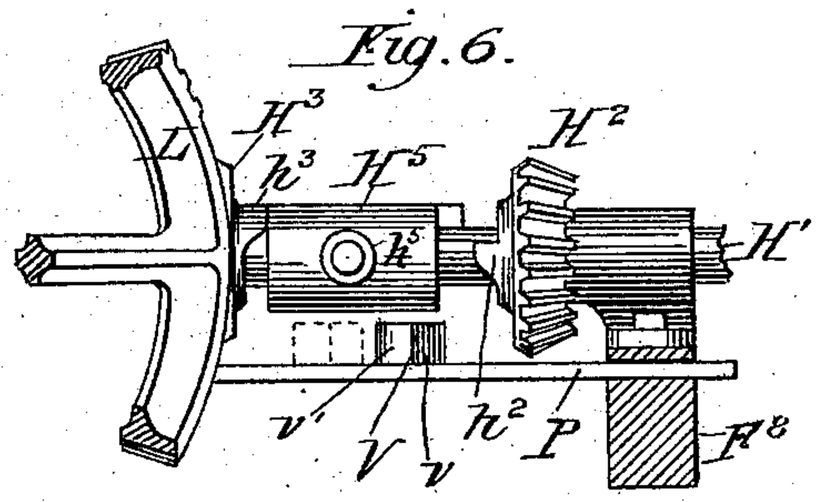
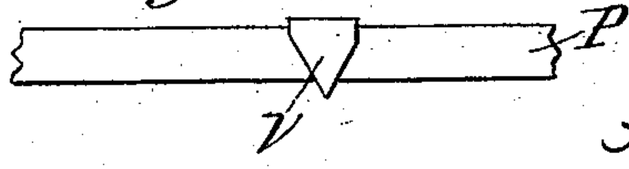


Fig. 7.



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GRAIN HARVESTER.

No. 372,339. Patented Nov. 1, 1887.

Fig. 8.

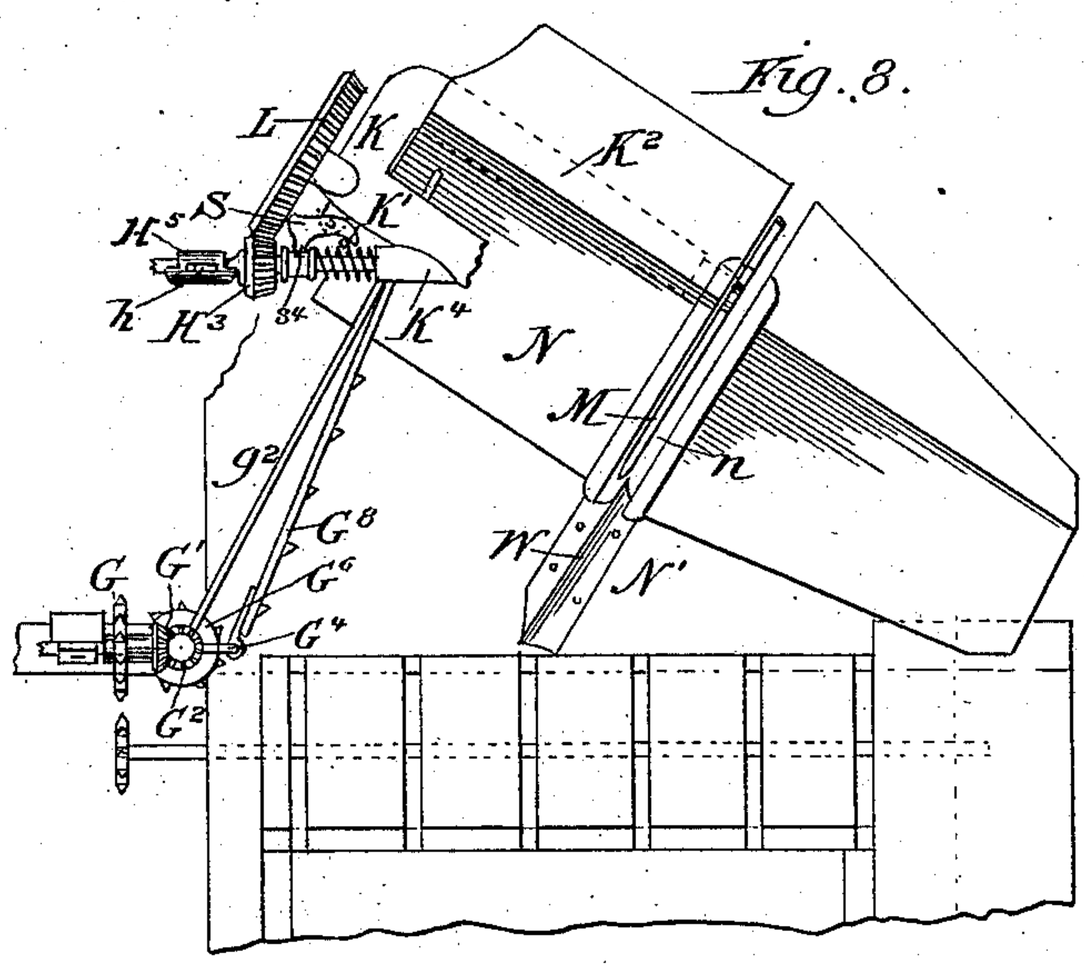

Fig. 9.

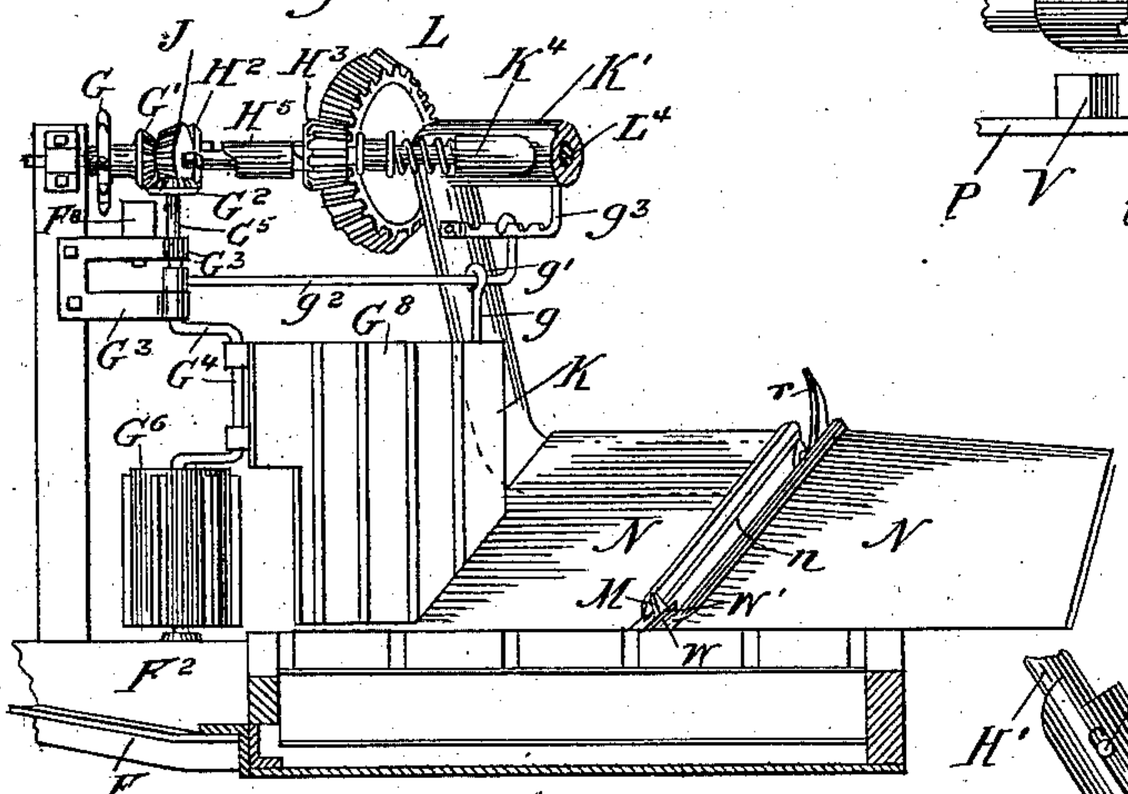

Fig. 10.

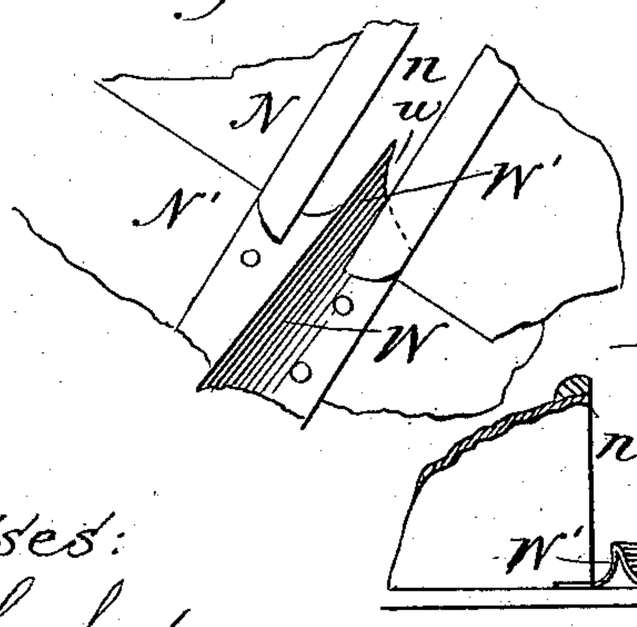

Fig. 13.

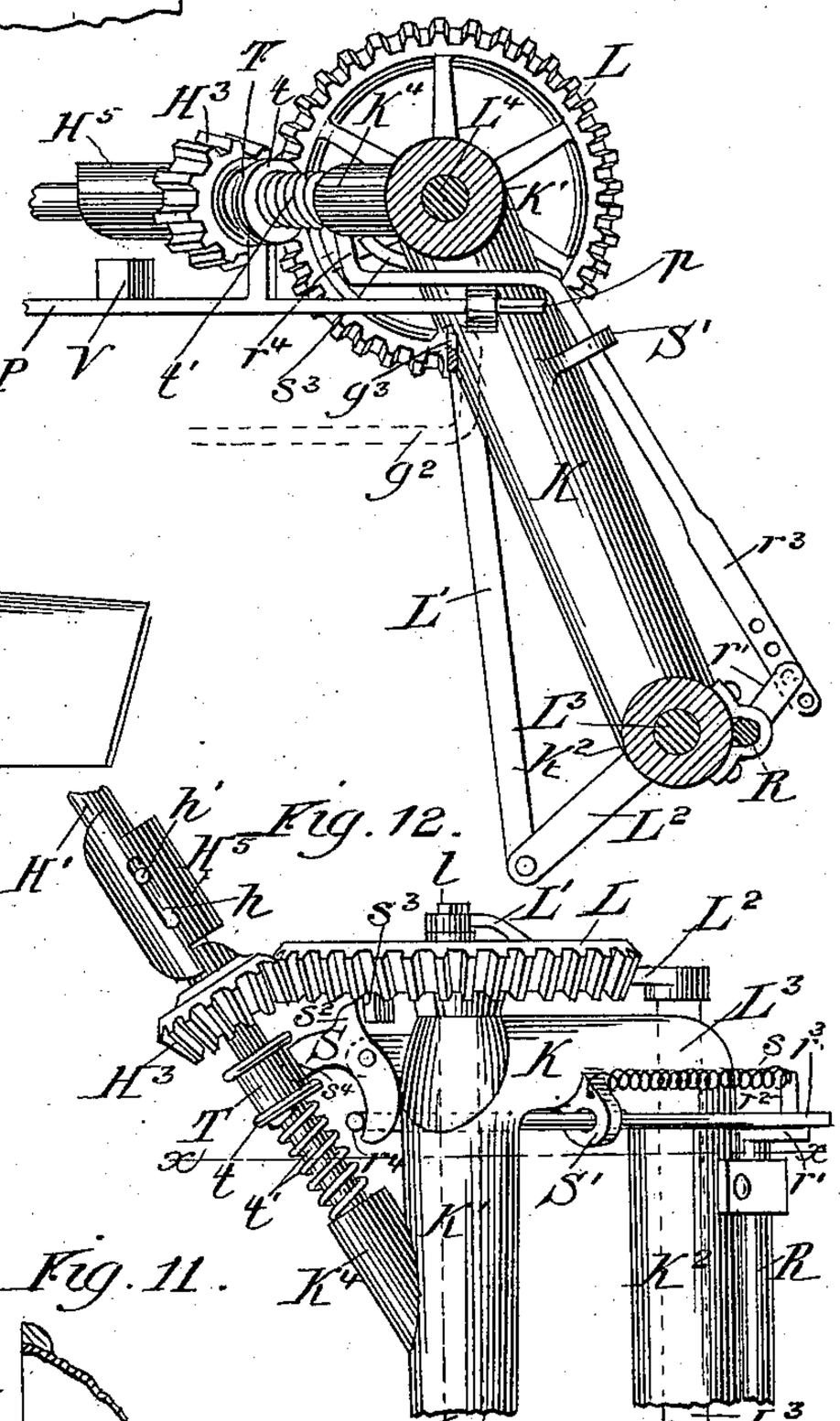

Fig. 12.

Fig. 11.

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(No Model.) 5 Sheets—Sheet 5.

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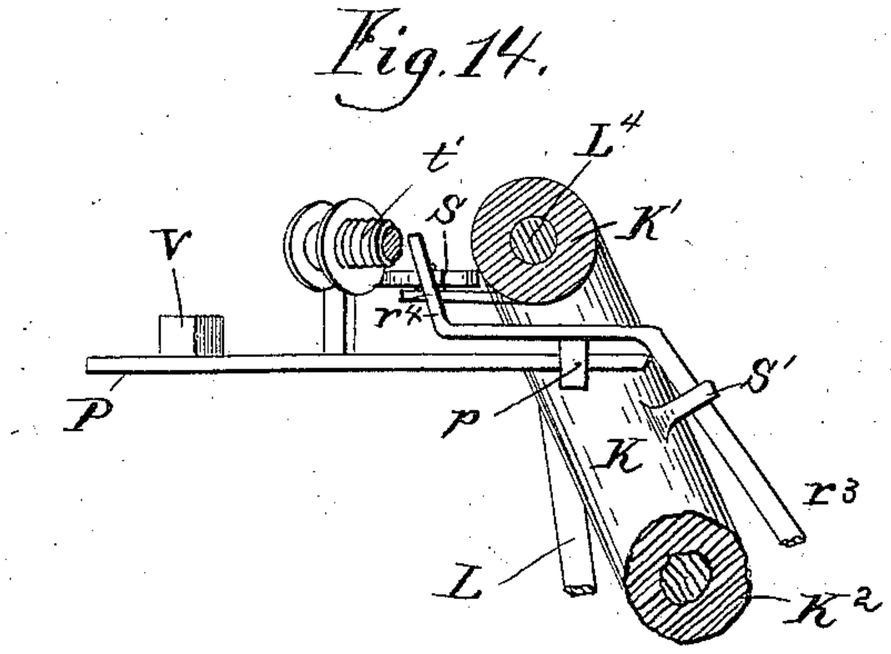
Fig. 14.



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UNITED STATES PATENT OFFICE.

ANDREW STARK, OF CHICAGO, ILLINOIS.

GRAIN-HARVESTER.

SPECIFICATION forming part of Letters Patent No. 372,339, dated November 1, 1887.

Application filed August 4, 1883. Serial No. 102,763. (No model.)

To all whom it may concern:

Be it known that I, ANDREW STARK, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Grain-Harvesters, which are fully set forth in the annexed specification and drawings pertaining thereto, from which any one familiar with the art to which the said improvements pertain can make and use the same.

Figure 1 is a plan of my machine. Fig. 2 is an elevation viewed from the grain side. Fig. 3 shows the same parts seen in Fig. 2 viewed from the opposite side, with the grain-platform, cutter-bar, and reel cut away. Fig. 4 is a view from the front of all parts appearing behind the vertical plane cutting the main driving wheel axis. Figs. 5, 6, and 7 show details of construction of the shipping-cam, shifting-clutch collar, and bevel-gearing by which the motion of the binder is produced and intermitted. Fig. 8 is a plan, and Fig. 9 is an elevation, of the grain-receiving platform and binder-platform. Fig. 10 is a plan, and Fig. 11 is a vertical section, of the needle and divider guard in the rift of the binder-platform. Figs. 12 and 13 are details of the rod which operates the shipping cam-operating lever and its connection with and relation to the clutch-shifting mechanism. Fig. 14 is a section taken at the line *z z* of Fig. 12.

A is the driving-wheel carrying the main driving-gear A′, secured to it.

B is the inner segment, supported by the sill F′ of the base-frame. To the segment B is secured the bracket B^2, which is also attached to the sill F′.

A^2 is a gear-pinion meshing with the main gear A′ and secured to the shaft A^3, and connected by suitable clutching mechanism to the bevel-gear A^7, which is loose on the same shaft and meshes with and drives the bevel-gear A^6, journaled in the bracket B^2 at right angles to the shaft A^3, and carrying the sprocket-wheel D to drive the subsequent mechanism, which it does by means of a chain over the sprocket-wheels C, G, and H, hereinafter described.

F is the outer sill of the base-frame of the machine, made, preferably, of angle-iron, extending from the inner divider around the driving-wheel and all connected mechanisms, except the platform and cutter-bar, to the point *f*, crossing the frame-sill F′ behind the drive-wheel, extending under the binder-platform, and joining the frame-sill F^2 at a point about midway between the platform-frame bars or sills F^3 and F^4. These parts F, F′, F^2, F^3, and F^4, framed together as described, constitute what I shall, for convenience, call the "base-frame" of the machine. I do not in this application base any claims upon the structure of this frame, having covered them in my application filed August 4, 1883, Serial No. 102,762. To this base-frame are secured the segments on both sides of the wheel, the inner segment, B, being secured to the cross-bar F′, as shown in Fig. 4.

F^3 is the finger-bar, constituting, also, the front sill of the platform, formed, preferably, of angle-iron and secured fast to the end of the base-frame, and by suitable brackets also to the lower end of the inner segment. To this frame and to the cross-bars named are secured the upright posts F^5, F^6, and F^7, which, with the cross-bar F^8, next described, afford supports for the grain switching, packing, and binding mechanisms. To the base-frame is secured the binder-gear standard K, which has the horizontal arm K′ overhanging the binder-platform and the horizontal arm K^2 underneath said platform and secured firmly to the base-frame by means of suitable brackets or intervening blocks.

F^8 is a cross-bar for supporting certain of the binder-driving mechanism. It is secured to an upward extension of the segment at one end and at the other end to the post F^7 by means of the bracket G^3, hereinafter described.

C is a sprocket-wheel secured at the end of the roller C′, journaled on the base-frame near the discharge end of the cutter-bar platform and parallel to the same. This roller is provided with teeth *c*, which revolve through slots *c′* in the receiving-platform E. The purpose of this combination of the roller C′ and its teeth *c* and the slots *c′* is fully set forth in my application for patent filed November 10, 1880, Serial No. 20,406.

G is a sprocket-wheel loose on an axle, which is fixed near the upper end of the upright posts F^6 and F^7. To its inner surface is se-

cured a bevel-gear, G′, meshing with the gear G^2, which is secured upon the upper end of the vertical shaft G^5, journaled in the bracket G^3 and having the crank-arm G^4.

Near the lower end of the vertical shaft G^5 is secured the vertical roller or drum G^6, which is preferably toothed or corrugated or provided with ratchet-vanes, as seen in Fig. 8. The purpose of this roller is to drive the butts of the grain as it is delivered from the grain-carrying platform backward and carry them across faster than the heads are being carried, and so throw the grain into an oblique position corresponding to that of the binder-platform and operating mechanism. To further assist the same process I provide the corrugated or ribbed swinging butt-board G^8, secured at one end to the crank-arm G^4, from which it receives its motion, being guided at the other end by the loop g, having the eye g' running on the horizontal rod g^2, which is sleeved at one end on the shaft G^5, between the shoulders of the bracket G^3, and rests the other end upon horizontal support g^3, jutting out from the binder-gear standard K.

It will be readily understood that the rotation of the crank G^4 will cause the butt-board G^8 to push the grain in the direction of its length, and will also carry the butts across toward the binder faster than the heads are traveling, thereby further assisting the turning of the grain into the desired oblique position. The support g^3 may be provided with notches, as shown in Fig. 9, in which the turned-over end of the rod g^2 may rest, so that the position of the butt-board may be adjusted toward or from the binder-arm as the length of the grain may require, being set closer in short grain and farther in long grain, so that the band may fall in the proper position on the bundle whatever the length of the grain.

H is a sprocket-wheel secured upon the shaft H′, which is journaled upon the cross-bar F^8. It extends forward and carries upon its forward end the mechanism for driving the reel. It extends backward and has its rear end journaled in the spur K^4 of the arm K′ of the binder-gear standard K. Upon this shaft are loosely secured two beveled gear-wheels, H^2 and H^3, and between them a double-clutch collar, H^5, having the slot h, through which protrudes the pin h', rooted in the shaft, and by means of which the collar is made to revolve positively with the shaft, but with longitudinal play thereon, so that it may engage the clutch-shoulders h^2 and h^3 upon the hubs of the gear-wheels H^2 and H^3, respectively. The gear-wheel H^2 meshes with the beveled gear-wheel J, rigidly fixed on the crank-shaft J′, which extends obliquely over the receiving-platform, being journaled in the bearing j, which is preferably of one piece with the bearing of the shaft H′, and at the other end in the bearing j' on the knotter-frame, which is secured to the rear extremity of the arm K′, as hereinafter described.

The crank-arms j^2 are connected to the packers j^3, which act alternately upon and pack, forward the flowing grain in the usual manner of such devices. The position of the crank J^4 is such with relation to the cranks j^2 that the divider J^5 passes down into the flowing grain simultaneously with one of the packers j^3, and at the lower limit of its stroke, as hereinafter explained, it stands while the binder-arm takes the bundle, and by means of the simultaneous action of the divider and one of the packers the bundle is by them sustained at two points and so prevented from tipping over while being grasped by the binder-arm. The cranks j^2 being longer than the crank J^4, the packers have a longer stroke than the divider J^5, which acts also as a packer, and by that longer stroke the packers advance the butts of the grain faster than the heads are advanced by the divider. Thus the packers and the divider, acting also as a packer, complete the turning of the grain into the oblique position necessary in order that it may be acted upon by the obliquely-placed binder. The binder-platform being somewhat higher than the surface of the grain carrying platform, the grain must be forced up a slight slope at some stage in its advance from the grain-carrying platform to the top of the binder-platform. The oblique position of the binder relatively to the grain-carrying platform makes the intervening distance greater on the front side than on the rear side—that is, greater at the butts of the grain than at the heads or at the middle—and hence the slope, if continuous, would be greater at the heads or middle than at the butts. As illustrated in Fig. 8 of the drawings, the receiving-platform is made substantially level over a triangular space, and the rise is all effected in the binder-platform, which thus slopes uniformly. The result would not be materially different if the slope were distributed equally from the delivery end of the carrying-platform to the top of the binder-platform. As illustrated, the grain delivered onto the receiving-platform encounters and is obstructed by the upward slope of the binder-platform sooner—or if the slope were made continuous would encounter a steeper slope—at the middle or toward the heads than at the butts, and is thereby retarded at the point of such obstruction, while advancing freely under the action of the forwarding devices at the butts, thereby further assisting the turning of the grain into the desired oblique position. The beveled gear H^3 meshes with the beveled gear L, fixed on the shaft L^4, which extends through the arm K′ of the binder-gear standard K. To the outer face, or to one of the spokes of the gear-wheel L, is fixed the crank-pin l, from which extends the connecting-rod L′, which actuates the lever L^2 of the rock-shaft L^3 underneath the binder-platform, and carrying at its rear end the needle or binder-arm M. The binder-platform N is slightly inclined upward from the receiving to the discharge end, and has the rift n, through which the divider de-

scends and the needle or binder-arm ascends to grasp the bundle. The binder-platform N is secured to the arm K^2 of the binder-gear standard K, or to the main base-frame beneath it, by suitable brackets or intervening blocks at any convenient points.

r is a trip-finger, which consists of the upbent end of the rock-shaft R, which lies under the binder-platform alongside of and resting in proper bearings secured to the arm K^2 of the binder-gear standard K, at the forward end of which it has the crank-arm *r'*, which is hinged to the lower end of the rod r^3, the point of its connection with said rod being adjustable upon the rod by any convenient means. As shown in the drawings, this adjustability is secured by providing the lower end of the rod r^3 with a series of holes, one above another, into any one of which the crank-pin of the crank-arm *r'* may be inserted. The rod r^3 extends up alongside of the binder gear standard K, is bent over, and passes under the arm K', being at any convenient points supplied with proper slide-bearings, and at the upper end is given a direct upward turn, bringing the end r^4 close alongside the shaft H', inside the angle between that shaft and the arm K' of the binder-gear standard and inside the point of the shipping-cam-operating lever S, for a purpose hereinafter explained. A spring, *s*, is attached either to the rod r^3 or to the lever-arm *r'*, and at the other end to any fixed point on the binder-gear standard or its arms—as to the lug S'—tending to throw the point r^4 up behind the shipping-cam-operating lever, except when drawn down by the action of the bundle pressing upon the trip *r*, as hereinafter explained.

P is a slide-bar having one point of support at *p* on the binder-gear standard K and another upon the cross-bar F^8. It is provided with the shipping-cam V, fixed upon its upper surface and extending up close to the surface of the double clutch-collar H^5, upon which there is provided the stud and roll h^5, which engages with the shipping-cam V, as hereinafter explained.

On the inner surface of the gear-wheel L is placed the cam S^3, adapted to engage with the spur S^2 of the shipping-cam-operating lever S, thereby performing a function hereinafter explained.

To the slide-lever P there is secured the collar T on the shaft H'. This collar has the flange *t*, and between it and the spur K^4, which furnishes the rear bearing for the shaft H', there is placed coiled about the shaft the spiral spring *t'*, tending to throw the collar T toward the gear-wheel H^3.

The combined action of these parts—viz., the trip with its connected levers and springs, the needle, the train of gears which drives it, and the packer and divider system and the gears which drive it—is as follows: The normal position of the double clutch-collar is engaging and driving the gear-wheel H^2, and thereby the gear-wheel J and the packer-arms j^2 and divider-arm J^5. In this position the trip-finger *r* stands above the binding-platform, and the point r^4 of the rod r^3 is in the position shown in Fig. 12, holding the shipping-cam-operating lever S against the flange *t* of the collar T, keeping the spring *t'* compressed and holding the slide P at the rear limit of its play in its bearings, in which position the shipping-cam upon the upper face of the slide is in the position shown by the dotted lines in Fig. 6. In this position, also, the clutch-collar H^5 being out of connection with the gear-wheel H^3, the wheel, and through it the needle-driving mechanism, is out of connection with the driving-power. Thus geared and connected the packers and the divider are performing their office of raking the grain from the receiving-platform and gathering it into a gavel on the binding-platform, and as the divider separates the gavel and by its downward sweep presses it forward, its pressure, acting against the trip-finger *r*, tips the rock-shaft R and withdraws the point r^4 of the rod r^3 from behind the shipping cam-operating-lever S, and thereupon the spring *t'*, reacting against the flange *t* of the collar T, slips it forward on the shaft H', thereby swinging the shipping-cam-operating lever into such position that its spur S^2 will be reached and acted upon by the cam S^3 on the gear L, and at the same time brings the shipping-cam V into the position shown by the full outline in Fig. 6—that is to say, so that its face V' will be exposed to the stroke of the stud-roll h^5 on the clutch-collar H^5, which is revolving constantly with the shaft H'. As the stud-roll strikes the face V' of the shipping-cam V, the clutch-collar H^5 is thereby caused to slide on the shaft H', out of connection with the gear-wheel H^2 and into connection with the gear-wheel H^3—that is to say, to be disconnected from the packer and divider operating mechanism, which then comes to rest, and to be connected to the binder-operating mechanism, which is thereby put in motion.

This is the position represented in Figs. 5 and 6. The first effect of the motion thus communicated to the gear-wheel L is to cause the needle to be thrown up by the tipping of the rock-shaft L^3, by means of the connecting-link L', and in proper time with that motion to drive the tying mechanism. (Not shown or described here, but which is connected to the rear end of the shaft L^4, and actuated by the cam and gear wheel P', which also carries the discharger-arm O, whose function of discharging the bundle is performed immediately upon the completion of the tying.) The next effect is, that when the tying is completed the cam S^3, on the gear-wheel L is by the revolution of that wheel brought into contact with the spur S^2 upon the shipping-cam-operating lever S, and forces the end S^4 of the lever against the flange *t* of the collar T, causing the collar to slide on the shaft H', compressing the spring *t'*, carrying the slide-bar P rearward and returning the shipping-cam to its first position, wherein the continued revolution of the shaft

H′, carrying with it the double clutch-collar H^5, brings the stud-roll h^5 against the face of the shipping-cam, by which contact the clutch-collar H^5 is slid forward on the shaft H′, disengaged from the gear H^3, and re-engaged with the gear H^2, this being the initial position—the binder out of gear and the packers and divider in gear. The clutch collar H^5 has at each end but a single tooth, and the gears H^2 and H^3 have likewise each but a single clutch-tooth to engage that of the clutch-collar H^5. The clutch-collar is shifted only when the stud-roll h^5 reaches the shipping-cam V on the slide P, and therefore only once and always at the same point in its revolution. The slide-bar P, shifted, as described, by the action of the pressure against the trip-finger of the grain supplied by the packers, is liable to be shifted at any time when the pressure becomes sufficient to move the trip finger; but after the slide P has been shifted the packers will continue to act until the revolution of the shaft H′ has brought the roll h^5 against the shipping-cam and shifted the clutch-collar H^5. This insures that the packers will always be released from the driving-power at the same point in their course, and so will always stand at rest in the same position. This position is such that the divider arm has just passed down through the rift *n* in the binder-platform N and stands with its point partly below the platform, so that when the needle M rises through the same rift it may pass close alongside the divider arm through the rift made and maintained in the grain by that arm. Now, there being only one tooth on each end of the clutch-collar H^5 and only a corresponding single tooth on each of the gears with which it engages, it results that even after the clutch collar H^5 has been shifted from the gear H^2 to the gear H^3, although the motion of the packing and dividing mechanism ceases, that of the binding mechanism does not begin until the single tooth of the clutch-collar H^5 has come into engagement with its mate on the gear H^3. The parts are so timed that unless the jarring of the machine or other outside cause has disturbed the position of the needle and its driving-gear since the last bundle was bound, the clutch-tooth on the gear H^3 is in position to be immediately engaged by the corresponding tooth on the clutch-collar H^5 as soon as the latter is shifted; but if it should be otherwise—if the clutch-tooth on the gear H^3 should be ahead of or behind its true position—the only result would be that the clutch-collar H^5 would miss it and complete its revolution before engaging it; but when so engaged the action of the parts would be as designed and described—viz., that the needle would come up through the platform while the divider is standing with its point protruded down through the rift therein and preserving a clear path for the needle through the grain, as described. Similarly, at the close of the binding movement, if the divider and packers shall have been jarred out of position, the clutch-collar H^5, when shifted by the stud-roll h^5, may miss the clutch-tooth of the gear H^2, and so may complete its revolution before effecting engagement with said gear, but when engaged its movement will be in perfect time, as described, and the only result of the delay in effecting the engagement will be that when the packers start, the bundle will be formed more quickly by reason of the accumulation of grain against and just outside of the divider during the delay.

In order to prevent the point of the needle coming up on the wrong side of the divider, and thereby becoming entangled with it, I provide the sheath W, of sheet metal, secured to the approach N′ of the binder-platform, having the tongue W′, extending over the rift *n* and bent so as to stand obliquely edgewise in the vertical plane of said rift, leaving the space *w* at one side for the divider to enter as it descends, while the needle enters the rift from beneath the platform on the other side of said tongue, which thus, acting as a switch, serves to insure the proper clearance of the points of the divider and the needle.

X is a grain-guard secured to the frame at any convenient point in front of the cutter-bar at such height that the standing grain will neither pass under nor fall over it to any great extent. It extends back over the discharge end of the cutter-bar platform outside the points of the packers, and may be secured to the rear end of the overhanging arm K′ of the binder-gear standard K. Its purpose is to keep the standing grain out of reach of the packers and prevent it becoming entangled with them, while at the same time allowing the prostrate grain to pass freely under it to the binder without offering any obstruction to the heads.

Y Y are rods or slats fastened to the grain-guard X, and thence extending sloping downward to within a short distance of the receiving and binding platforms, where they may terminate without other support. The packers are designed to work between them. Their purpose is to keep the inflowing grain closely down on the binder-platform while being compacted by the packers. I prefer to secure them at one end only, thereby gaining the advantage of having them slightly yielding as the grain accumulates under them and adapted to act as a spring-compressor.

I claim—

1. In a self-binding harvester, the combination of the cutter-bar in substantially the same vertical plane with the axis of the driving-wheel, the platform-carrier adapted to convey the grain in a direction parallel with the cutter-bar, a grain-receiving platform at the delivery end of the grain-carrying platform, having its front side longer than its rear side, means for clearing the grain from the carrying-platform and transferring it to the receiving-platform, a binding-table beyond the receiving-platform, and packing, binding, and discharging mechanisms adapted to pack, bind, and discharge

the bundle obliquely to the direction of motion of the platform conveyers, substantially as set forth.

2. In a self-binding harvester, in combination with the cutter-bar platform and the stationary receiving-platform adjacent to the delivery side thereof, mechanism for moving the grain in a direction parallel to the cutter-bar from the cutter-bar platform and lodging it upon the receiving-platform beyond the reach of the grain-moving devices of the cutter-bar platform, and additional mechanism to turn the grain while it lies on the receiving-platform into position oblique to the cutter-bar, and a binder mounted upon the harvester-frame stubbleward from the receiving-platform in a position oblique to the cutter-bar, substantially as set forth.

3. In a self-binding harvester, in combination with the cutter-bar platform and the stationary receiving-platform adjacent to the delivery side thereof, mechanism for moving the grain in a direction parallel to the cutter-bar from the cutter-bar platform and lodging it upon the receiving-platform beyond the reach of the grain-moving devices of the cutter-bar platform, and additional mechanism to turn the grain while it lies on the receiving-platform into position oblique to the cutter-bar and advance it over the receiving-platform in a direction obliquely backward from the direction of the movement by which it reached the cutter-bar platform, and a binding arm or needle located stubbleward from the receiving-platform and operating in a vertical plane oblique to that of the cutter-bar, substantially as set forth.

4. In combination, substantially as set forth, an endless-apron conveyer located in the rear of the sickle and moving parallel thereto, a receiving-platform located at the delivery side of the conveyer and receiving the grain lodged upon it from the endless-apron conveyer, mechanism which acts upon the grain after it has left the endless apron and while it lies upon the receiving-platform and advances it sidewise over the latter in a direction obliquely backward from the line of motion of the endless apron, and a binding table or deck located at the delivery side of the receiving-platform, and a binding-arm operating thereon to receive and bind it in such oblique course.

5. In a self-binding harvester, the combination, with a binder placed obliquely to the line of the cutter-bar, of a reciprocating arm to advance the butts of the grain, a similar arm to advance the heads, and operating mechanism adapted to give the former a longer stroke than the latter, substantially as set forth.

6. In a self-binding harvester, a butt-evener and grain-switching device consisting of a roller on a vertical shaft revolving in contact with the butts of the grain, in combination with a swinging and reciprocating vertical butt-board acting against the same ends of the grain in the same direction as the roller.

7. In a self-binding harvester, a butt-evener and grain switching device consisting of a vertically ribbed or corrugated roller on a vertical shaft revolving in contact with the butts of the grain, in combination with a vertically ribbed or corrugated swinging and reciprocating vertical butt-board acting against the same ends of the grain in the same direction as the roller.

8. In a self-binding harvester, the combination, substantially as hereinbefore set forth, of a grain-carrying platform adapted to convey grain from behind the sickle in a direction parallel therewith, a grain-receiving platform located at the delivery end of the grain-carrying platform, having its front side longer than its rear side and its delivery end oblique to its receiving end and terminating at the delivery end in an upward-sloping binder-platform, and mechanism located and adapted to act upon the grain between the butts and the middle to advance it across the receiving-platform and onto the binder-platform, the upward slope of the binder-platform operating to obstruct the heads of the grain, while it is freely advanced at the butts across the longer side of the receiving-platform, substantially as set forth.

9. In a self-binding harvester, the combination, substantially as hereinbefore set forth, of a grain-carrying platform adapted to deliver the grain from behind the sickle in a direction parallel thereto, a grain-receiving platform located at the delivery end of the grain-carrying platform, having its front side longer than its rear side and its delivery end oblique to its receiving end and merging at its delivery end in an upward-sloping binder-platform, and mechanism located and adapted to advance the butts of the grain across the longer side of the receiving-platform and onto the binder-platform, whereby the grain shall be turned into a position oblique to that in which it is received upon the receiving-platform, substantially as set forth.

10. In a self-binding harvester, the combination, substantially as hereinbefore set forth, of a grain-carrying platform adapted to convey the grain from behind the sickle in a direction parallel thereto, a grain-receiving platform located at the delivery end of the grain-carrying platform, having its front side longer than its rear side and its delivery end oblique to its receiving end and merging at its delivery end in an upward sloping binder-platform, mechanism for advancing the grain across the receiving-platform and onto the binder-platform, and additional mechanism for advancing the butts of the grain across the longer side of the receiving-platform.

11. In a self-binding harvester, the combination, substantially as hereinbefore set forth, of a grain-carrying platform adapted to convey the grain from behind the sickle in a direction parallel thereto, a grain-receiving platform located at the delivery end of the grain-carrying platform, having its front side longer than its rear side and its delivery end

oblique to its receiving end and merging at its delivery end in an upward-sloping binder-platform, packer-arms adapted to advance the grain by alternating strokes at or near the middle and near the butts, and the mechanism whereby such packer-arms are actuated.

12. In a self-binding harvester, in combination, substantially as hereinbefore set forth, a grain-carrying platform adapted to convey the grain from behind the sickle in a direction parallel thereto, a grain-receiving platform located at the delivery end of the grain-carrying platform, having its front side longer than its rear side and its delivery end oblique to its receiving end and merging at its delivery end in the binder-platform oblique to the delivery end of carrying-platform, packers and mechanism adapted to actuate them alternately with the binder, and continuously-actuated mechanism to advance the butts of the grain across the longer side of the receiving-platform.

13. In a binder placed obliquely to the line of the cutter-bar of the harvester to which it is attached, the combination of the grain packing and dividing mechanism and the grain-binding mechanism, both driven by bevel-gears on one shaft lying at right angles to the line of the cutter-bar, substantially as set forth.

14. In a self-binding harvester, the combination of the binder-gear standard, the binder-shaft L^1, journaled in the upper arm, K′, of the said binder-gear standard, the binder-mechanism driving-shaft H′, oblique to the arm K′ and journaled therein, and the intermeshing bevel-gears on said shafts, respectively, substantially as set forth.

15. In a self-binding harvester, the combination of the divider and its actuating mechanism, a constantly-revolving clutch-collar adapted to engage the divider-actuating mechanism at one point only in its revolution, the packers, a trip-finger adapted to be actuated by the pressure of the grain accumulated by the packers, and mechanism intermediate between said trip-finger and the clutch-collar actuated by the trip and actuating the clutch-collar at one stage only in the revolution of the latter, whereby the clutch is engaged with and disengaged from the divider-actuating mechanism at one point only in the revolution of the latter, substantially as set forth.

16. The combination of the trip r and the mechanism connecting it to the detent r^4, the shipping-cam-operating hook S, and mechanism by which it shifts the shipping-cam V, with the sliding clutch-collar H^5, provided with a projection to engage the shipping-cam V, substantially as set forth.

17. The combination of the shaft H′, the gears H^2 and H^3, loose on said shaft, and the packing and binding mechanisms actuated by them, respectively, the clutch-collar H^5, sliding on and revolving with the shaft H′ between the gears H^2 and H^3, and mechanism actuated by the packing and binding mechanisms to shift the clutch-collar into clutch with said gears alternately, substantially as set forth.

18. In a self-binding harvester, the combination of mechanism adapted to bind and discharge the bundle in a position oblique to the direction of the motion of the grain-carrying platform, mechanism for turning the grain flowing from the grain-carrying platform into such oblique position, and supports for such turning mechanism, sustained wholly in front of the line of the butts of the flowing grain, substantially as set forth.

19. In a low-down self-binding harvester, the combination, with a system of packers located and adapted to pack the grain into a bundle to be bound in a position oblique to the line of motion of the grain-carrying platform, of a grain-guard arranged over the discharge end of the grain-carrying platform to prevent the falling grain from being blown into the packing and binding mechanisms, substantially as set forth.

20. In a platform self-binder, the combination of the packing and binding mechanisms with the grain-guard X, supported solely above and in front of the binder-platform to permit the grain to flow to the binder without obstructing the heads of the grain by the supports of such guard, substantially as set forth.

21. In a self-binding harvester, the combination of a grain-carrying platform, a grain-binding table, grain-packing and grain-binding mechanisms located obliquely to the direction of motion of the platform-carrier, and one or more grain-guards extending from above the discharge end of the grain-carrying platform over the binder-table in a direction coinciding with the path of motion of the grain-packers and of the grain in its passage to the binder to prevent the grain in such passage being blown or otherwise deflected from its course, substantially as set forth.

22. In combination with a binder-platform having a rift through which the needle ascends and the divider descends nearly together, a needle guard and switch, W, standing into such rift, substantially as and for the purpose set forth.

In testimony that I claim the foregoing as my invention I have hereunto set my hand, in the presence of two witnesses, at Chicago, Illinois, this 11th day of July, A. D. 1883.

ANDREW STARK.

Attest:

L. W. NOYES,

A. S. MOORE.