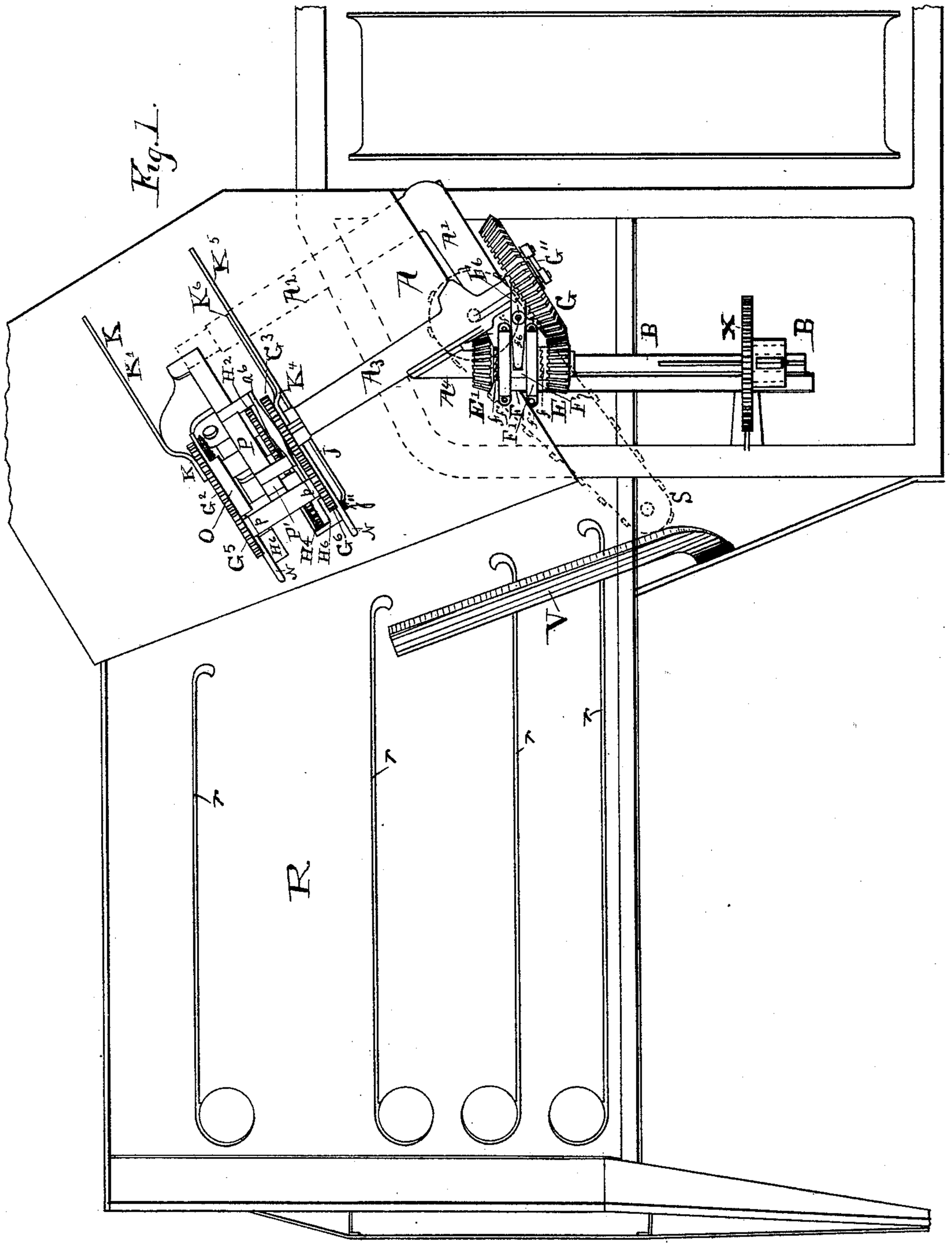
(No Model.) 5 Sheets—Sheet 1.

LA VERNE W. NOYES.

GRAIN HARVESTER.

No. 414,241. Patented Nov. 5, 1889.



Witnesses:
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Inventor:
LaVerne W. Noyes
by Chas. S. Burton
his Atty.

(No Model.) 5 Sheets—Sheet 2.

LA VERNE W. NOYES.

GRAIN HARVESTER.

No. 414,241. Patented Nov. 5, 1889.

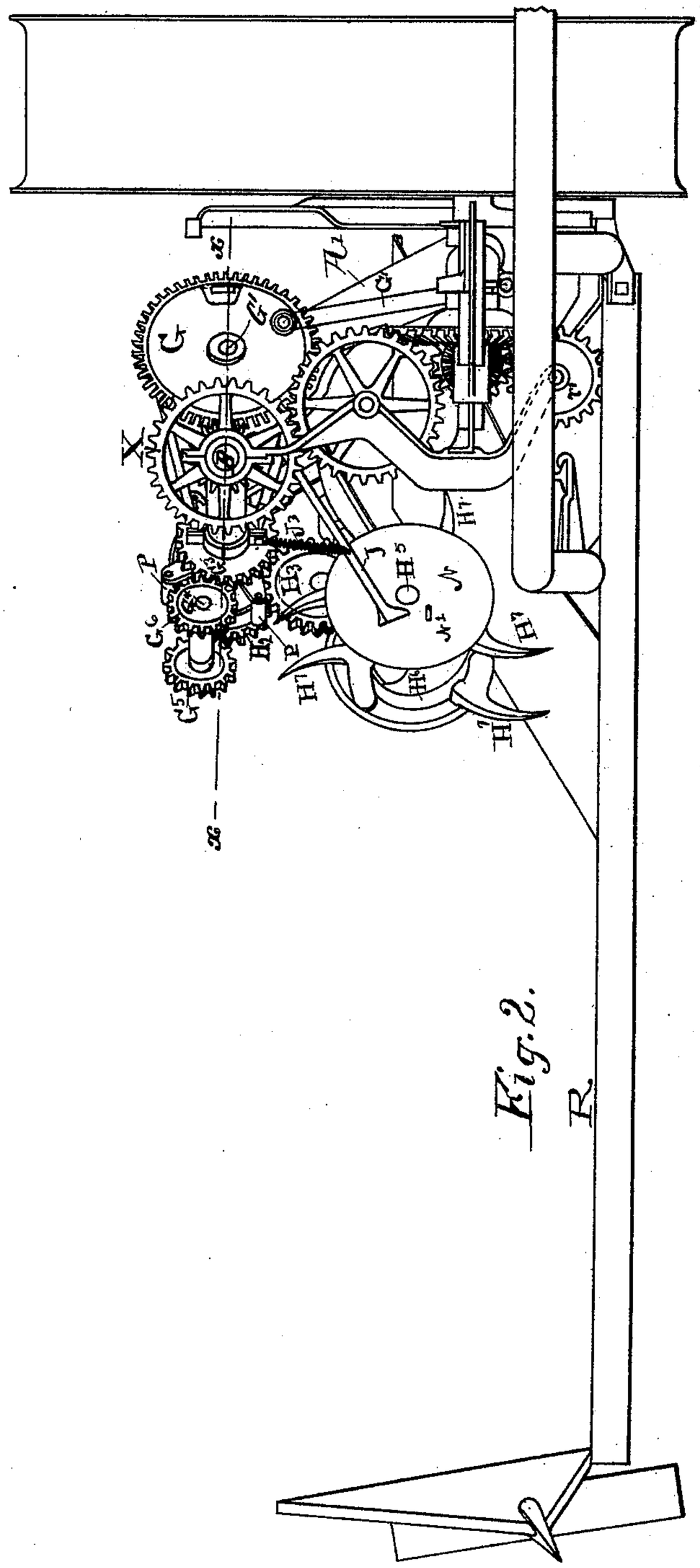

Fig. 2.

R.

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(No Model.) 5 Sheets—Sheet 3.

LA VERNE W. NOYES.

GRAIN HARVESTER.

No. 414,241. Patented Nov. 5, 1889.

Fig. 3.

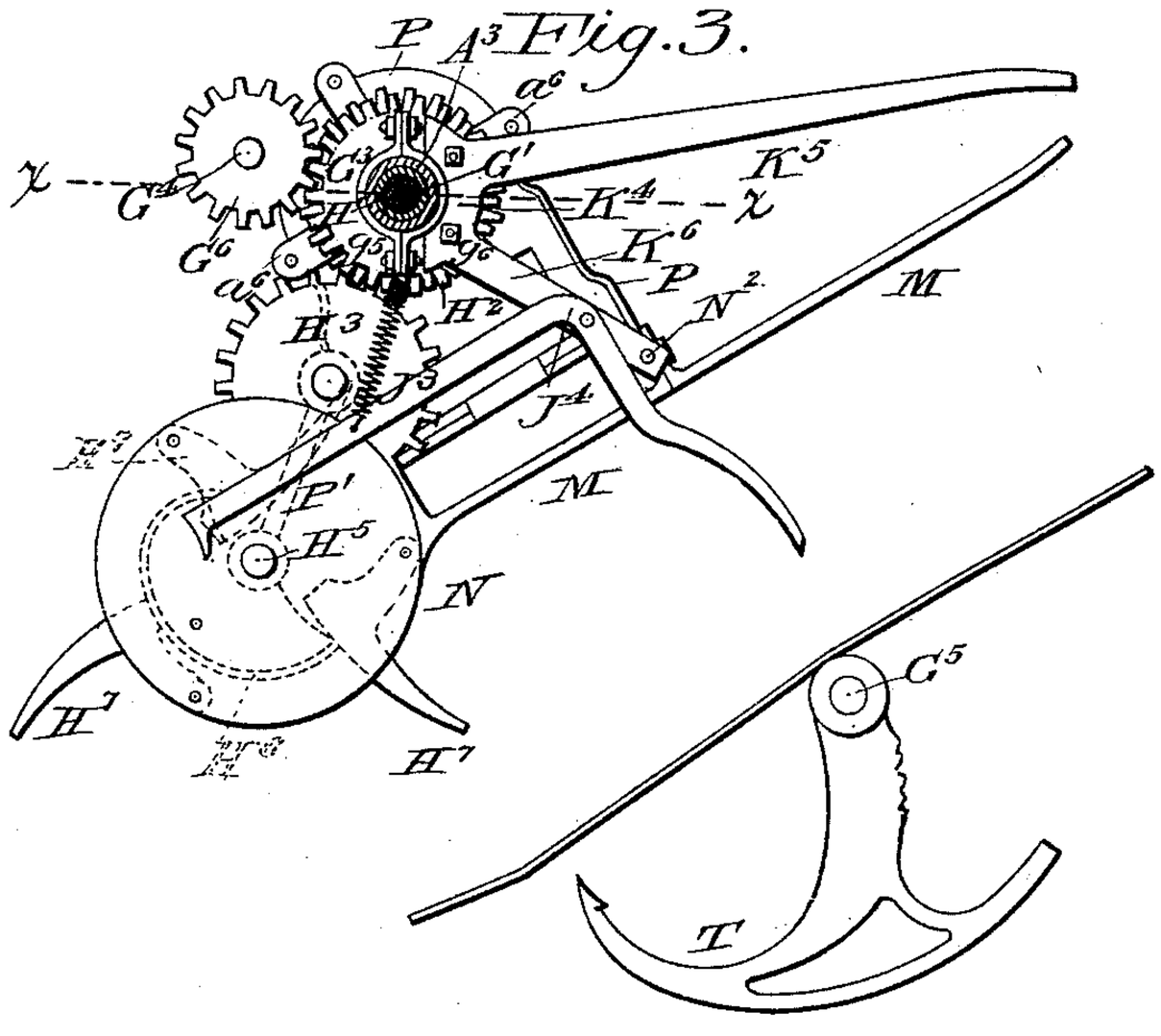
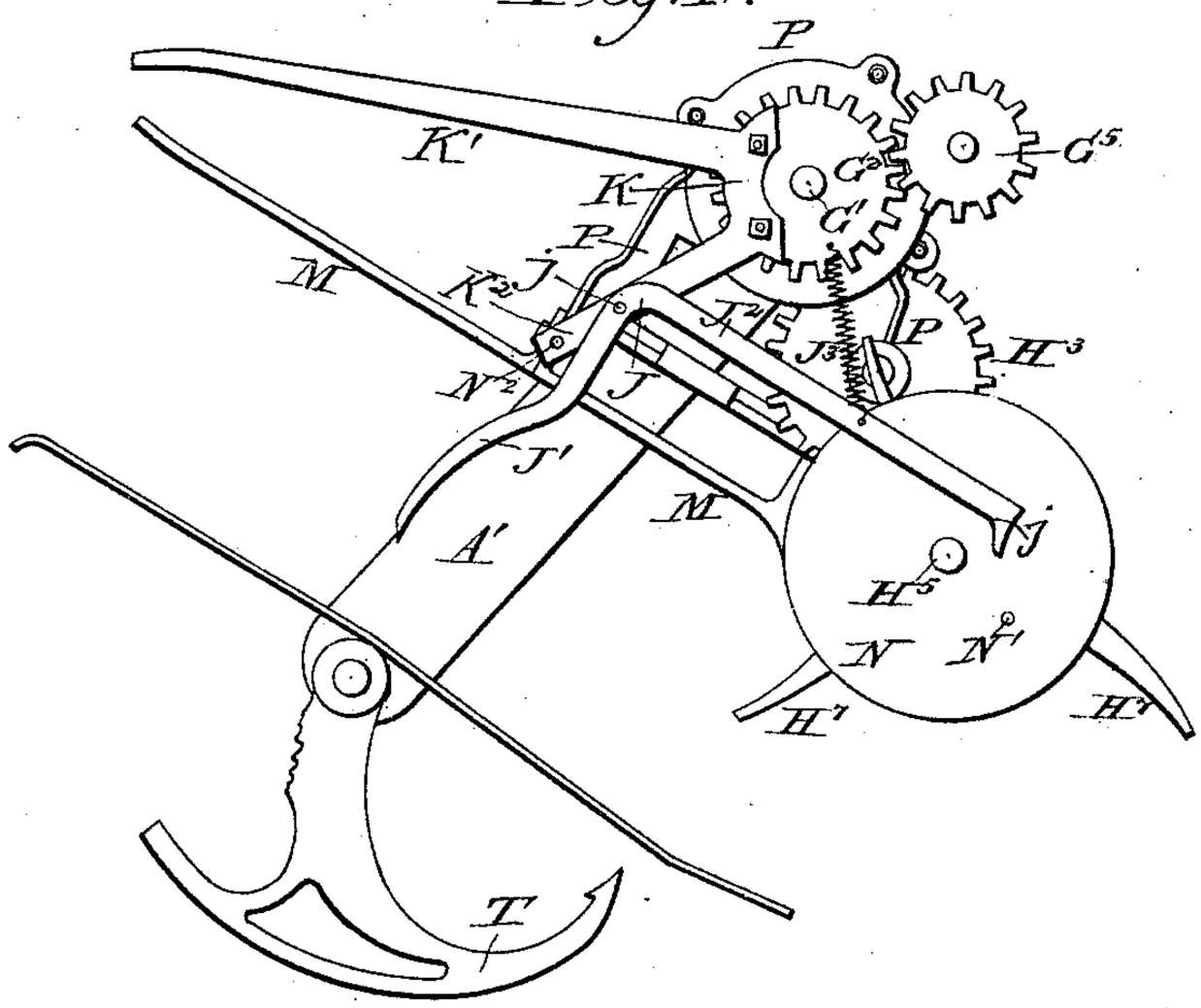


Fig. 4.



Witnesses:
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(No Model.) 5 Sheets—Sheet 4.

LA VERNE W. NOYES.

GRAIN HARVESTER.

No. 414,241. Patented Nov. 5, 1889.

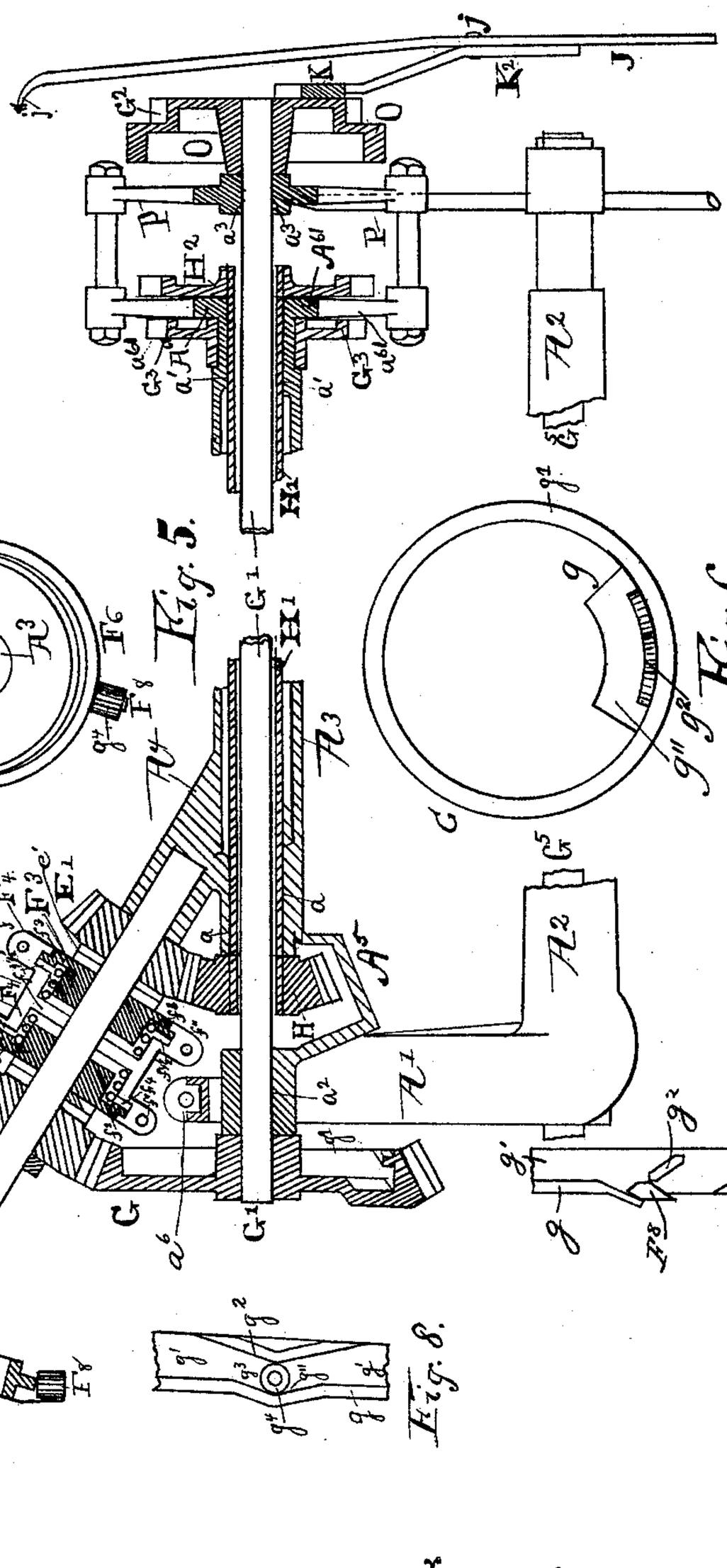

Fig. 5.

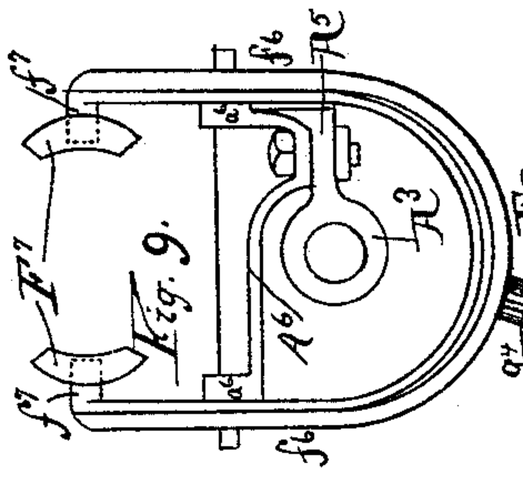

Fig. 9.

Fig. 6.

Fig. 10.

Fig. 8.

Fig. 7.

Witnesses:

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(No Model.) 5 Sheets—Sheet 5.

LA VERNE W. NOYES.

GRAIN HARVESTER.

No. 414,241. Patented Nov. 5, 1889.

Fig. 12.

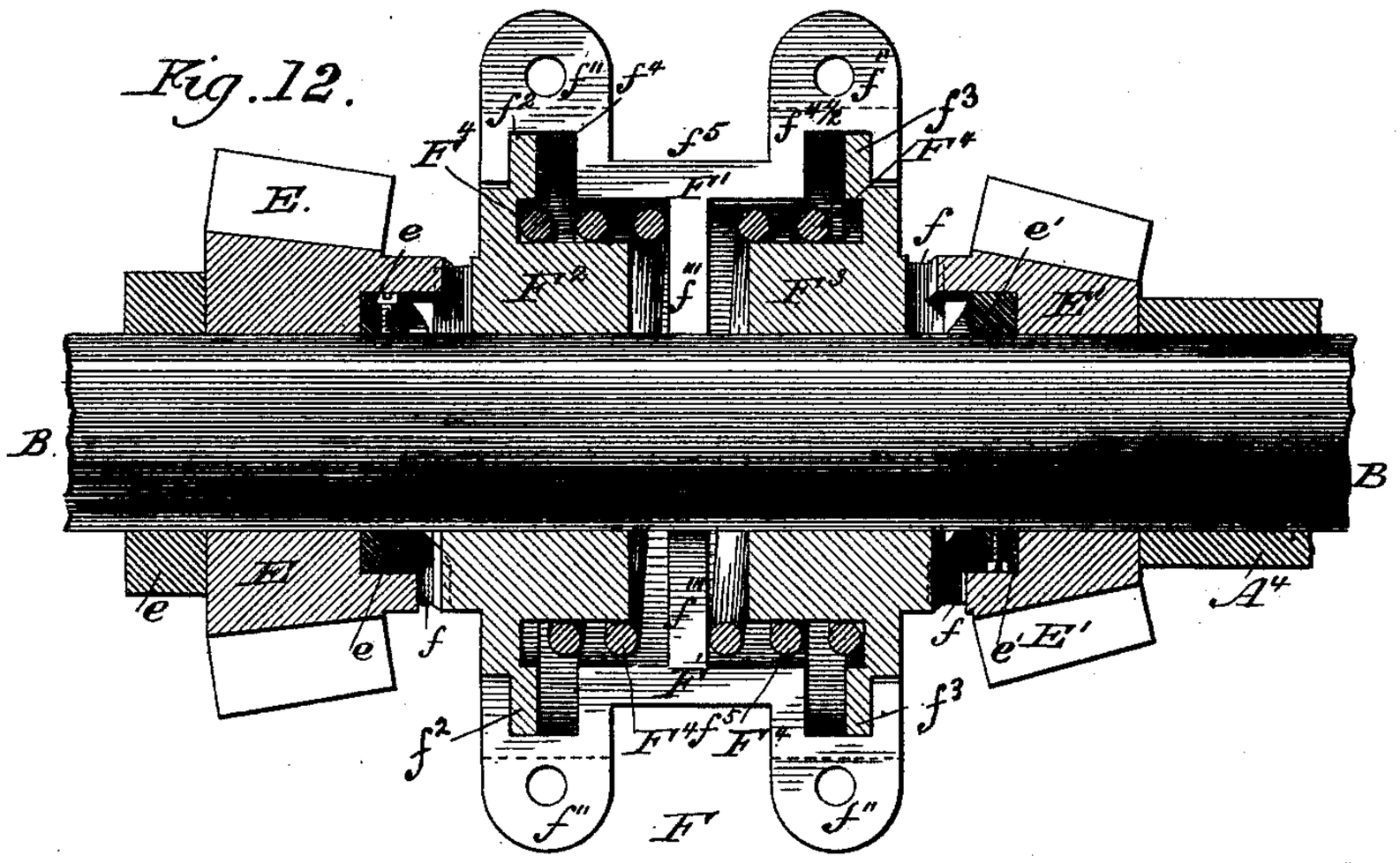


Fig. 11.

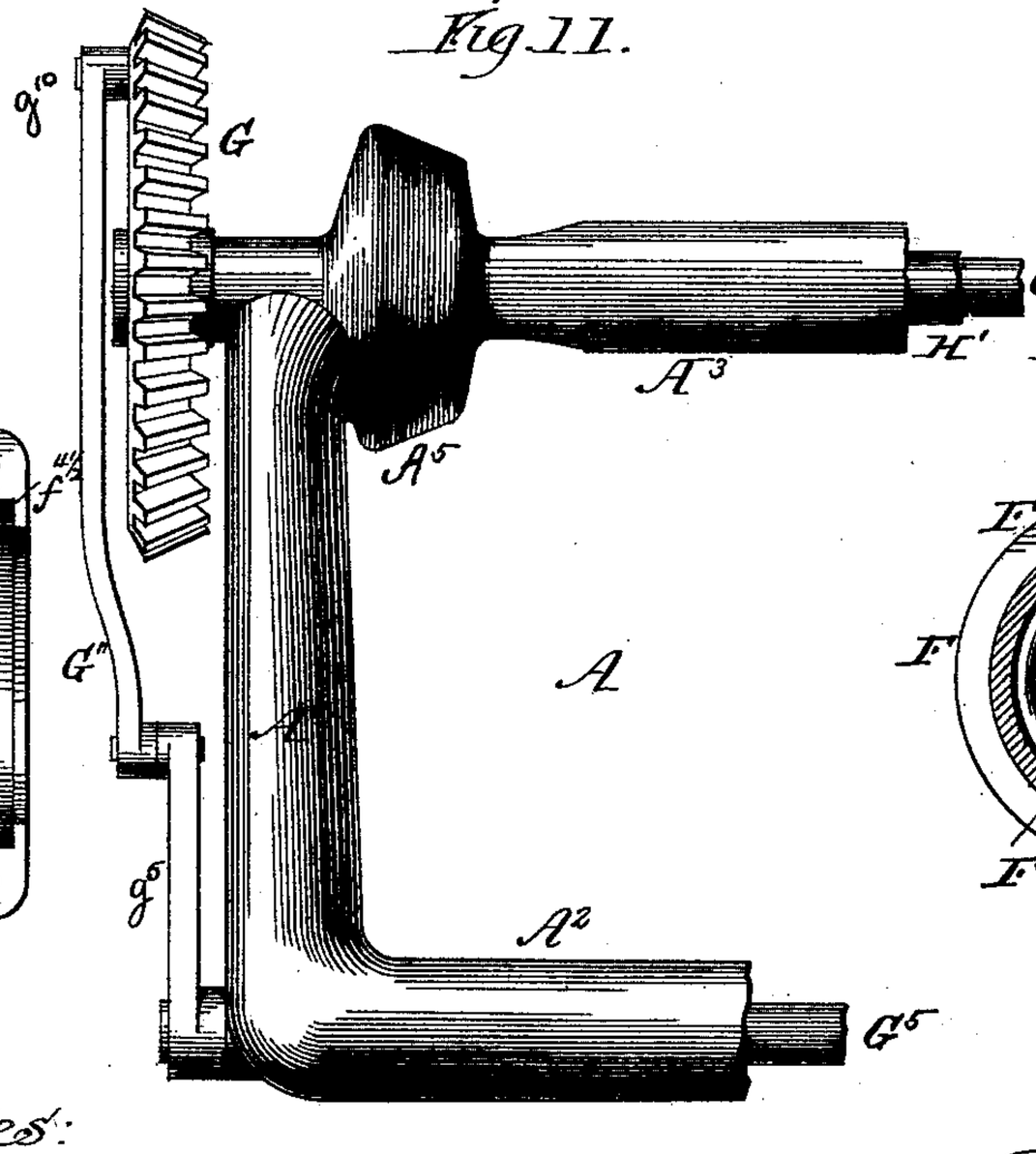


Fig. 13.

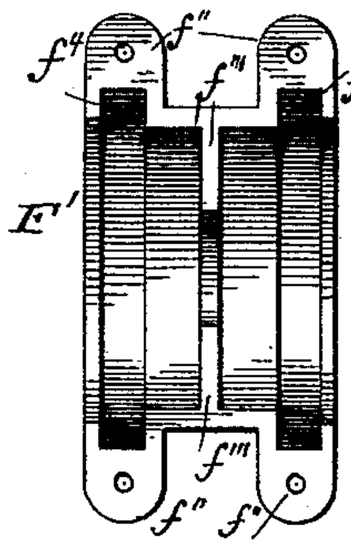
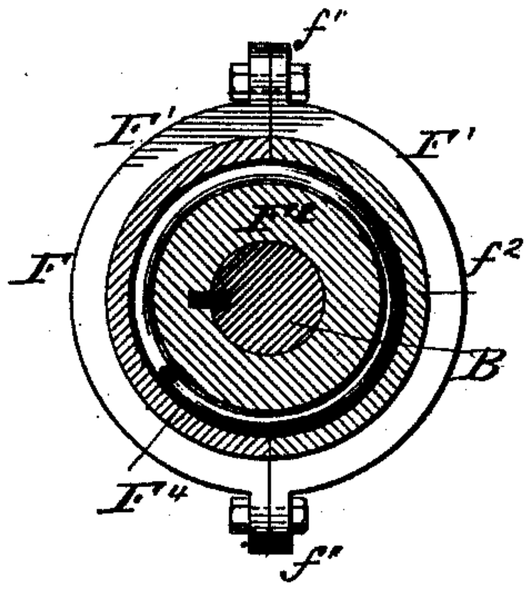


Fig. 14.



Witnesses:

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Fred G. Dieterich

Inventor:

L. W. Noyes

By Chas. D. Burton

Attorney.

UNITED STATES PATENT OFFICE.

LA VERNE W. NOYES, OF CHICAGO, ILLINOIS, ASSIGNOR TO WILLIAM DEERING, OF SAME PLACE.

GRAIN-HARVESTER.

SPECIFICATION forming part of Letters Patent No. 414,241, dated November 5, 1889.

Application filed November 3, 1884. Serial No. 147,139. (No model.)

To all whom it may concern:

Be it known that I, LA VERNE W. NOYES, 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, of which the following specification contains a full and complete description.

This invention consists, first, in a novel tripping mechanism; second, in novel clutching mechanism; third, in providing the clutch with a yielding backing, which will prevent premature and imperfect engagement of its members; fourth, in a peculiar construction of binder-frame, whereby the packer-driving shaft and the binder-driving shaft have coincident axes within said frame, but do not bear one upon or within the other; fifth, in the combination of an obliquely-acting packing mechanism with a carrying-platform, whereby the grain is delivered obliquely to such obliquely situated and acting packers.

Figure 1 is a plan of my platform and binder, showing the general arrangement of parts. Fig. 2 is a front elevation of the same. Fig. 3 is a front sectional elevation of the binder, showing the needle, the trip and discharger, and the packers. Fig. 4 is a rear elevation of the same parts. Fig. 5 is a horizontal section through the line *x x* on Fig. 3. Figs. 6, 7, and 8 are details of the cam in the binder-driving wheel which shifts the clutch-lever. Fig. 9 is a side elevation, and Fig. 10 is a horizontal section of the clutch-shifting lever. Fig. 11 is an outer side elevation of the frame. Fig. 12 is an axial section of the clutch. Fig. 13 is a plan of one of the separable halves of the case of the clutch. Fig. 14 is a transverse section of the entire clutch.

A is the binder-frame, sustained upon the main frame of the machine and arranged to be adjusted horizontally to and from the main driving-shaft by mechanism which is fully explained in my patent, No. 327,581, dated October 6, 1885. The binder-frame consists of the upright support A′, the horizontal arm A^2 under the binder-platform, and the horizontal arm A^3 overhanging the binder-platform.

B is the driving-shaft for the packing, binding, and discharging mechanism. It is feathered through the gear-wheel X, which is journaled on the main frame and derives power from any continuously-moving part of the main driving-train of the harvester. The shaft B has its rear end journaled in the lug A^4 on the arm A^3 of the binder-frame. It communicates motion alternately to the packing mechanism and the binding mechanism, the alternation being effected in the manner and by the means which will be now described.

E is a bevel-gear pinion loose on the shaft B, and kept in place by suitable retaining stops or collars *e* on the said shaft. E′ is also a bevel-gear pinion loose on the same shaft, and retained in place between the end of the lug A^4 and a suitable retaining stop or collar *e′* on the shaft. The gear E meshes with and drives the gear G, which is fixed to and carries the binder-shaft G′. The gear E′ meshes with and drives the gear H, which is fixed to and carries the packer-driving shaft H′. The axes of these shafts coincide, and their bearings are hereinafter fully described.

Between the bevel-gear E and the bevel-gear E′, and feathered onto the shaft B, is the compound clutch-wheel F. Both ends of this clutch-wheel, opposed to the bevel-gears E and E′, respectively, are provided with the clutch-teeth *f*, adapted to be engaged by the clutch-teeth of the said gears E and E′. This clutch consists of the case F′, made in halves and fastened together by bolts through the lugs *f″*, the clutch-collars F^2 and F^3, inclosed within such case, and the springs F^4 F^4, coiled around the hubs of the clutch-collars within the case F′. The case F′ has a middle partition *f‴*, provided with a central opening for the shaft B. It has also the two interior annular grooves f^4 $f^{4½}$, and a peripheral groove f^5 midway between its ends. The clutch-collars F^2 and F^3 have flanges f^2 and f^3, which engage, respectively, in the grooves f^4 and $f^{4½}$ of the case F′. The width of the grooves is greater than the thickness of the flanges, and the interior cavity of the case on either side of the middle partition is wider than the thickness of the clutches F^2 and F^3 therein, so that the said clutches have a play in the case F′ lengthwise of the shaft B. The

springs F^4 F^4 bear at one end against the flanges f^2 f^3 and at the other end against the middle partition f''', and so tend to hold the clutch-collars F^2 and F^3 outward toward the bevel-gears E and E′, respectively.

To the lug A^5 on the arm A^3 of the binder-frame I secure the bracket A^6, to which, and closely embracing the two shoulders a^6 a^6, so as to be guided thereby, I pivot the U-shaped or forked lever F^6, which horizontally strides the arm A^3 of the binder-frame, and has its two tines or branches f^6 bent inward toward each other, forming the studs f^7, which engage in the shoes or bearing-pieces F^7 F^7, which are fitted in the peripheral groove f^5 of the case. At its other end, on the other side of the arm A^3, the lever F^6 is provided with a stud F^8, which bears against the web g of the binder driving-gear G, and within the circle of the flange g' on said wheel. The web is provided with a recess g'', and opposite thereto, on the flange g', is the cam-spur g^2, the web and spur at this point forming between them the cam-groove g^3, and the stud F^8 is provided with a roll g^4 to adapt it to travel through said groove with the least friction.

Instead of the stud and roll and the cam-groove of the form described, the stud may be shaped as illustrated in Fig. 7, and the groove may be bounded by the cam-surfaces of the form illustrated in Fig. 7, on the web and flange, respectively.

The operation of the structure is that as the wheel G revolves the stud F^8 enters the groove g^3 and the lever F^6 is thereby shifted. When the stud is in contact with the web elsewhere than in the groove g^3, the clutch F is engaged with the pinion E and drives the binding mechanism, including the needle actuated by the rock-shaft G^{50}, connected by the link G″ to the gear-wheel G; and when the stud F^8 is in the cam-groove g^3 the clutch F is in engagement with the pinion E′ and drives the packers. Standing at the first situation, with the binder in action, when in the revolution of the wheel G the cam-groove g^3 engages the stud F^8 and the stud reaches the apex of the said groove, and the lever F is thereby shifted and throws the clutch F out of engagement with the gear-pinion E and into engagement with the gear-pinion E′, the driving-power being thereby disconnected from the gear-wheel G, it and the entire binding mechanism come to rest and will so remain until some means shall rotate the wheel G far enough to carry the groove beyond the stud and shift back the clutch F into engagement with the pinion E. The pressure afforded by the packers which are now being driven by engagement of the clutch F with the gear-pinion E′ is the means for effecting the change. The gear-pinion E′ drives the gear-wheel H, which carries the packer-driving shaft H′, concentric with the binder-shaft G′, and journaled as hereinafter described. The gear H^2, fixed on the rear end of the shaft H′, drives the packer-shaft H^5 by means of the intermediate gear H^3 meshing with the gear H^4, fixed on the packer-shaft. The grain is accumulated by the packers under the guard M, against the arm J′ of the bell-crank lever J, which is pivoted at j to the radial arm K^2, which extends rigidly from the binder-shaft, being attached to any convenient wheel or exposed part of the shaft. As illustrated, it is forged of one piece with the discharger-arm K′, and the said piece K is attached to the side of the wheel G^2. The arm J^2 of the bell-crank lever J extends toward the packer-wheel N, revolved on the shaft H^5, and has its end j'' bent laterally toward the face of said wheel and preferably expanded vertically, as shown, so that said end j'' stands in toward the face of said wheel N and close alongside the same. To the arm J^2 is attached the spring J^3, whose other end is attached to the gear-wheel G^2, or to any convenient part which revolves with the shaft G′, and so tends to draw the arm J^2 toward the shaft G′, and to swing the depending arm J′ in toward the packers. On the face of the packer-wheel N, I provide the stud N′, jutting sideward, but not so far as to strike the arm J^2 except at its laterally-bent end j''. When sufficient grain has been accumulated by the packers to form a bundle, and thereby sufficient pressure is exerted upon the arm J′ to force it outward against the retracting effect of the spring J^3, it will turn on its fulcrum j until it meets the pin N^2 on the radial arm K^2. If the pressure is sufficiently great it will start the radial arm forward and initiate a revolution of the binder-shaft G′; but if it is not sufficient to start said arm K^2 the arm J^2, having been made to descend at its forward end, so that its expanded part j'' stands over into the track of the stud n' on the packer-wheel N, will be presently engaged by the stud, whereby said horizontal arm J^2 is driven endwise stubbleward and thereby starts the radial arm K^2 and initiates the rotation of the shaft G′ and of the wheel G, a slight motion of which forces the cam-stud F^8 out of the cam-groove g^3, shifts the lever F^6, disengages the clutch F from the gear-pinion E′, and brings it into engagement with the gear-pinion E, which, thus acquiring motion, continues the revolution of the wheel G and of the gear-wheel G^2, which latter wheel revolving carries around with it the radial arm K^2 and the bell-crank lever J. This motion continues until the binding mechanism has made one complete revolution, and the cam-groove g^3 again engages the stud F^8, and, thereby shifting the lever F^6 and the clutch F, brings the binding mechanism to rest. As the stud is passing into the groove and shifting the lever F^6 the disengagement of the clutch F from the pinion E is progressing, and if the momentum of the wheel G and of the binding mechanism is not great the motion of the wheel and the progress of the cam-stud F^8 into the cam-groove, and so the shifting of the lever F^6 and

the sliding of the clutch F on the shaft B, will cease at the instant the clutch-teeth on the clutch-collar F^2 are disengaged from the clutch-teeth on the gear-pinion E. While the clutch-collar F^2 is withdrawing from the pinion E the opposite clutch-collar F^3 is entering into engagement with the gear-pinion E′, and both pinions revolve together during the time that the shifting of the clutch is being completed. A similar overlapping of motion occurs when the clutch is shifted in the opposite direction, since the shifting motion is positive, If the clutch-teeth of the clutch-collar, by reason of coming into contact point to point with the clutch-teeth of the gear-pinion, should bind at the points so engaged and carry the pinion by such mere frictional contact instead of properly meshing, a breakage of some of the connected parts would result. To prevent this possibility is the purpose of the peculiar structure of the clutch and the reason for employing therein the springs F^4, for the pressure by which the points of the clutch-teeth of the clutch-collar and of the gear will be held together will be only that afforded by the spring F^4, there being at the instant of such accidental engagement no other resistance than that afforded by the spring, and this force will not cause the parts to engage with sufficient firmness to drive the gear-pinion. If, therefore, such accidental engagement should occur, the spring will yield and allow the teeth of the collar to slip off the teeth of the gear, and before the next teeth on the gear are encountered the clutch will have been shifted enough farther to effect a positive and full engagement between the clutch and the gear. The shaft H′, which drives the packing mechanism, is tubular and has its bearings at a and a' in the arm A^3 of the binder-frame. The binder-shaft G′ passes through the entire length of the tubular shaft H′ and has its bearings beyond it at both ends, the front bearing being at a^2 in the binder-frame at the upper end of the upright standard A′ and its rear bearing at a^3 in the frame P, an adjunct of the arm A^3, which is secured to the said arm A^3 beyond the bearing therein of the shaft H′. This frame P is hereinafter described. The arm A^3 of the binder-frame is expanded at its front part into the shell A^5 to allow room for the bevel gear-wheel H, and at the rear end it terminates in the flange A^{61}, bearing the lugs a^{61}, which afford means of attaching the frame P, which is in effect an expansion of the arm, wherein space is obtained for the gear-wheel H^2, and which affords bearing beyond said wheel for the rear end of the binder-shaft G′. From the frame P, as integral therewith, I extend downward and grainward the hanger P′, in which is journaled the packer-shaft H^5. Integral with the hanger P′, I make the packer-guides H^6.

The packing mechanism is of familiar construction, comprising the teeth H^7, pivoted to the packer-disks N and guided by the guides H^6. The plane of rotation of the teeth is oblique to the binder driving-shaft B, as the shafts H′ and G′ are oblique to the said shaft B and to the driving-wheel.

At the rear end of the binder-shaft G′, outside the bearing in the frame P, is secured to said shaft the wheel O, which actuates the various parts of the knotting mechanism, which are designed to be journaled and otherwise supported upon various extensions and lugs on said frame. The details of this structure are not illustrated, since they form no part of the present application. The needle T is actuated in the usual manner by the rock-shaft G^{50}, to which it is secured, said shaft being journaled in the lower arm A^2 of the frame and actuated by the link G″, connected to the crank-arm g^5 of the rock-shaft and to the wrist-pin g^{10} of the gear-wheel G. The vertical plane of the needle is, as usual, somewhat forward of that of the wheel O.

In the foregoing description of the tripping and clutching mechanism, reference was made only to one trip. I find it desirable, however, in order to insure the true position of the bundle, that there should be two arms against which to pack the bundle—one on each side of the binding arm or needle T. I also find it desirable to have two dischargers—one on each side of the needle—to insure the positive and direct delivery of the bundle after it is bound. The trip and discharger arms K^2 and K′, constituting the piece k, revolve completely around with the binder-shaft g', and I duplicate both and drive them on the rear side of the needle by mechanism which I will now describe. On the frame P, I provide the bearings $p\ p$, and in them journal the shaft G^4, having equal gears G^5 G^6, fixed on its two ends outside the bearings $p\ p$. Meshing with these equal gears I provide the equal gears G^2 and G^3, the former fixed on the end of the shaft G′ (and preferably, as illustrated, integral with the wheel O) and driving the gear G^5, and the latter journaled on the arm A^3 of the binder-frame, being made in halves g^5 and g^6, and bolted together in place about its said bearing, as illustrated in Fig. 3. Just forward of the point at which the frame P is bolted thereto and driven by the gear G^6 to the gear G^3, I fix the piece K^4, having the two arms K^5 and K^6, respectively, parallel and similar to the arms K′ and K^2 of the piece K, attached to the gear-wheel G^2. The arm K^6 may be provided at its outer end with a bell-crank lever J^4, similar to the bell-crank lever J, and similarly actuated and operating. It is not necessary, however, that both the bell-crank levers should have the horizontal arm extended, so as to be actuated by the stud on the packer-disk, since one of them will equally well communicate the starting motion to the binder-shaft. The discharger-arms K′ and K^5 stand in the path of revolution, ahead of the trip-arms K^2 K^4. When the necessary pressure is attained to start the trip-arms forward, they carry the shaft G′ and bring the binder into gear with

the clutch F, as above described, and their motion and that of the discharger is continued throughout the entire revolution, in the latter part of which the dischargers, having passed up over the arm A^3, descend ahead of the trips, behind the finished and bound bundle, and discharge it to the ground, and the shaft G′ comes to rest with both trips and dischargers in their initial position. Thus the trips do not come back into their position of rest until after the bundle has passed clear of the machine, and in returning to that position they follow the same direction as the bundle which is being discharged, thus avoiding a difficulty sometimes experienced when the trip is so constructed and located that it necessarily reverses its motion when it returns to rest, and thereby is in danger of encountering the bundle while it is being discharged.

In both tripping and discharging great advantage is derived from having two arms—one on each side of the plane of motion of the binding-needle and packers and rear compressor—since when but one arm is used to afford resistance to the packing, that arm is liable to act as a fulcrum about which the bundle is turned into a position unfavorable for binding; and when but one arm is used to discharge the bundle the cord becomes the fulcrum and causes the bundle to be discharged endwise, and, sometimes bringing it into a direction parallel with its own motion, passes by it lengthwise and fails to discharge it.

R is the cutter-bar platform. Its structure is described in detail in my patent, No. 327,581, dated October 6, 1885.

The conveying mechanism consists of endless chains with carrying-teeth traveling through the slots *r r*, in a stationary platform. In order to cause the chains to deliver the grain to the binder in an oblique position corresponding to that of the packing and binding mechanism, I construct the platform so that the carrying-teeth of the chains pass under the upper sheath of the platform and are stripped of the grain on a line extending obliquely back grainward from the heel of the sickle.

The details of the mode of stripping and of tripping the teeth into action are fully described in my application above mentioned.

I find it desirable sometimes to employ, to complete the turning of the grain into the proper oblique position, the butting-belt S, which is an endless belt driven and carried on vertical shafts at the front side of the receiving and binding platform, and having its grain-actuating ply moving from a point near the inner end of the sickle obliquely stubbleward toward the binder. Its operation is to push the grain endwise while also somewhat hastening the butts, and so insuring the proper oblique position of the grain when it is presented to the binding arm or needle. This butting-belt, when used in connection with the endless-chain conveyers described in this application, should stand with its end nearest the cutter-bar, somewhat in front of and grainward from the delivering end of the front chain conveyer, so that the butts of the grain carried by that conveyer may be brought up into contact with the butting-belt, so that its ribs *s* will seize the butts and with certainty act upon them in the manner above described. This butting-belt may be driven by any convenient connection with the driving train of the harvester, and its action should be uninterrupted; but it should act whenever the sickle is in action. As situated and illustrated it is driven by bevel-gear on the rear end of the shaft *r′*, which gives motion to the platform-conveyers.

In order to obtain the largest possible space for the accumulation of grain between the end of the platform-conveyer and the packers without setting the binder farther toward the wheel or increasing the space between the wheel and the sickle, I prefer to make the endless conveyers strip and deliver the grain along a line, hereinafter referred to as the "clearing-line," whose rear end shall be some distance nearer the grain end of the platform than the inner cutting-point of the sickle, thereby borrowing from the platfrom rather than from the binder the space needed, and in order that the grain cut off by the inner end of the sickle may be turned back into position parallel with the grain brought up to the clearing-line by the chains I provide the guard V, attached to the inside divider and overhanging the platform, extending back and sloping down grainward in a direction which if continued would intersect the platform parallel to the clearing-line, so that the grain as it falls against it will be guided so that its heads will move grainward and it will reach the platform in the desired position. Of course it is not necessary that the position or slope should be exactly in accordance with the above description, and I have found that a very slight extension of the guard obliquely back grainward from the inside divider is sufficient to accomplish the purpose sought.

I claim—

1. In a self-binding harvester, the combination of a series of endless conveyers moving parallel with the cutter-bar and in the rear thereof and having their delivering-points lying in a line extending obliquely grainward across their lines of motion, the rearmost of said delivering-points being nearer to the grain end of the platform than the heel of the sickle, with packing mechanism whose path of action extends obliquely toward the rear of the drive-wheel.

2. In a grain-binder, the combination of the binder-shaft, a radial arm revolved thereby about the axis of said shaft, a lever pivoted to said radial arm and adapted to receive the pressure of the gavel and to be moved there-

by into engagement with a moving part of the packing mechanism, substantially as set forth.

3. In a grain-binder, the combination of a trip-lever adapted to receive the pressure of the gavel and to be moved thereby into engagement with a moving part of the packing mechanism, a rigid arm revolved by the binder-shaft about the axis of said shaft and actuated by the trip-lever, the driving gear-wheel on the binder-shaft, a cam on said gear-wheel, a lever actuated by said cam, a clutch shifted by said lever on a continuously-revolving shaft, said shaft, and a gear-wheel loose thereon and adapted to be engaged by the clutch and meshing with the gear-wheel which carries the binder-shaft, substantially as and for the purpose set forth.

4. In an automatic grain-binder, in combination with the binder-driving train, the lever actuated positively alternately in opposite directions by mechanism in the binder-driving train, and the clutch shifted by the lever into engagement with said binder-driving train, said clutch provided with a yielding connection with said lever, substantially as and for the purpose set forth.

5. In an automatic grain-binder, in combination with the binder-driving train and the packer-driving train, a lever actuated positively alternately in opposite directions by mechanism in one of said trains, a clutch shifted by said lever alternately from engagement with one to engagement with the other of said trains, said clutch provided with a yielding connection with said lever, substantially as and for the purpose set forth.

6. In an automatic grain-binder, in combination with the grain-binding mechanism, and with a clutch whereby the binder-driving train is connected with the driving-power and with mechanism which throws the said clutch into engagement, of a yielding spring in and forming part of the connection between said engaging mechanism and the clutch, whereby the clutch is enabled to yield and avoid driving the binder-gear except upon positive engagement therewith, substantially as set forth.

7. In an automatic grain-binder, the clutch F, consisting of the case F′, having the exterior peripheral groove f^5, the clutch-collars F^2 and F^3, and the springs F^4, combined and co-operating substantially as set forth.

8. In an automatic grain-binder, the grain-binding and grain-packing mechanisms, the continuously-revolving shaft B, and the gears E and E′, loose thereon, the double clutch F, composed of the case F′, the clutch-collars F^2 and F^3, and the springs F^4, the cam-wheel G in the binder-train, and the lever F^6, actuated by said cam-wheel, all combined and co-operating substantially as and for the purpose set forth.

9. In a grain-binder, the binder-frame arm, the tubular packer-driving shaft journaled therein, the binder-shaft passing through the tubular packer-driving shaft and journaled in the binder-frame arm at both ends beyond the ends, respectively, of the packer-driving shaft, substantially as set forth.

10. In a grain-binder, in combination with the binder-frame arm, the tubular packer-driving shaft journaled therein, the binder-driving shaft extended through the tubular packer-driving shaft and journaled in the arm, the parallel dischargers K′ and K^5, the former fixed on and revolved by the binder-shaft outside the needle, and the latter journaled on and revolved about the binder-frame arm, substantially as set forth.

11. In a grain-binder, in combination with the binder-frame arm, the tubular packer-driving shaft journaled therein, the binder-shaft extended through the packer-driving shaft and journaled in the binder-frame arm, the parallel trip-arms K^2 and K^6, the former fixed on and revolved by the binder-shaft outside the needle, and the latter journaled on and revolving about the binder-frame arm, substantially as set forth.

In testimony whereof I have hereunto set my hand, in the presence of two witnesses, at Chicago, Illinois, this 11th day of September, A. D. 1884.

LA VERNE W. NOYES.

Attest:
C. S. BURTON,
F. W. PARKER.