(No Model.)

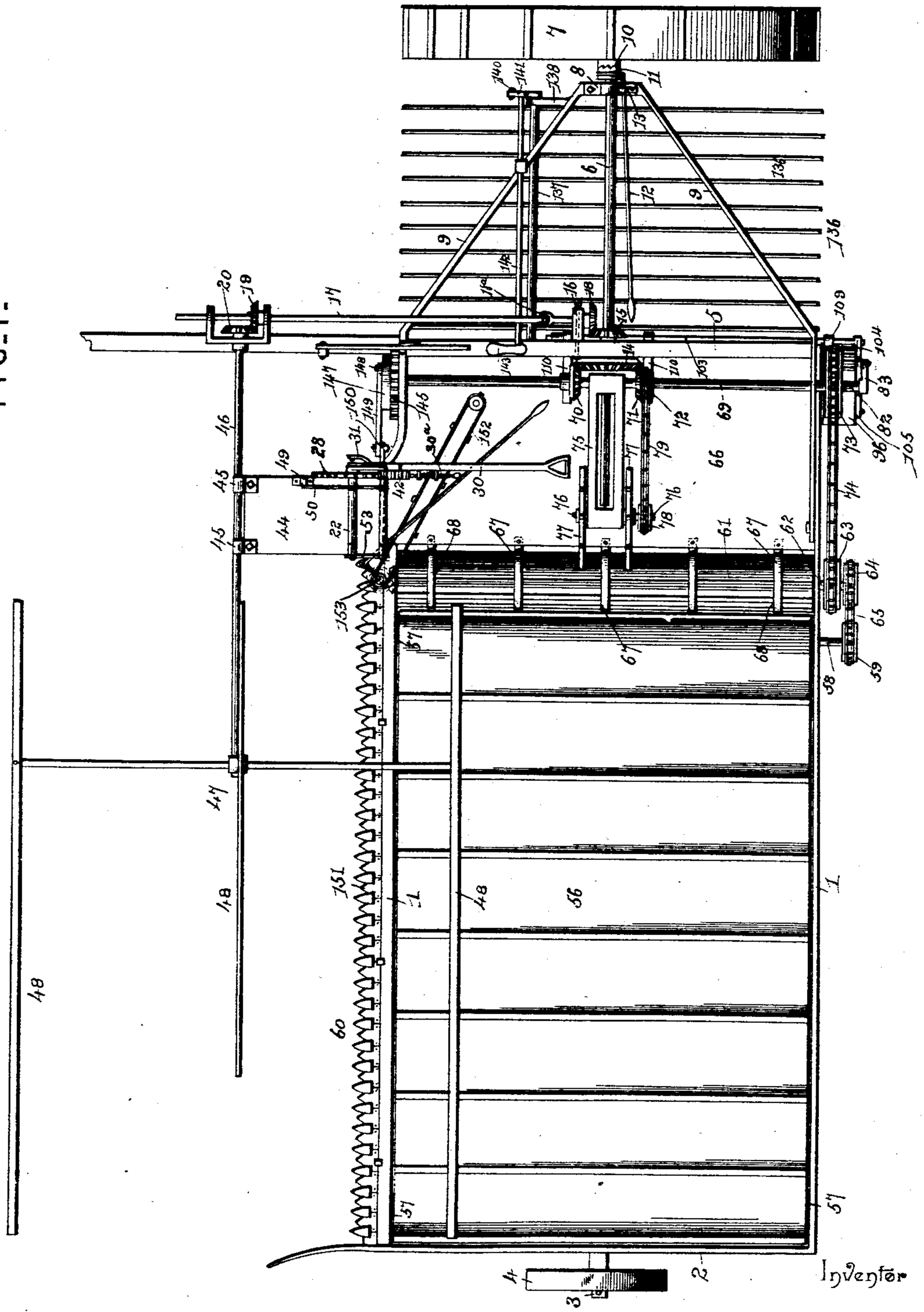
4 Sheets—Sheet 1.

E. F. WELLS.

GRAIN BINDING HARVESTER.

No. 520,153. Patented May 22, 1894.

FIG. 1.



Witnesses

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FIG. 19.

FIG. 9.

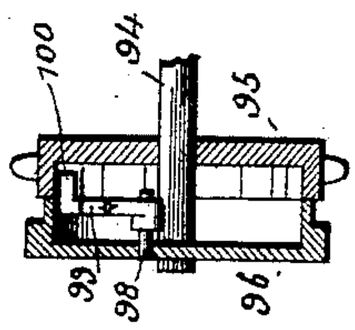

FIG. 18.

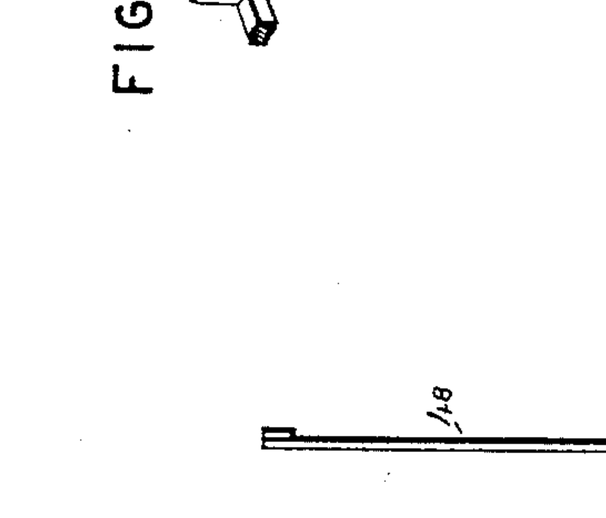

FIG. 2.

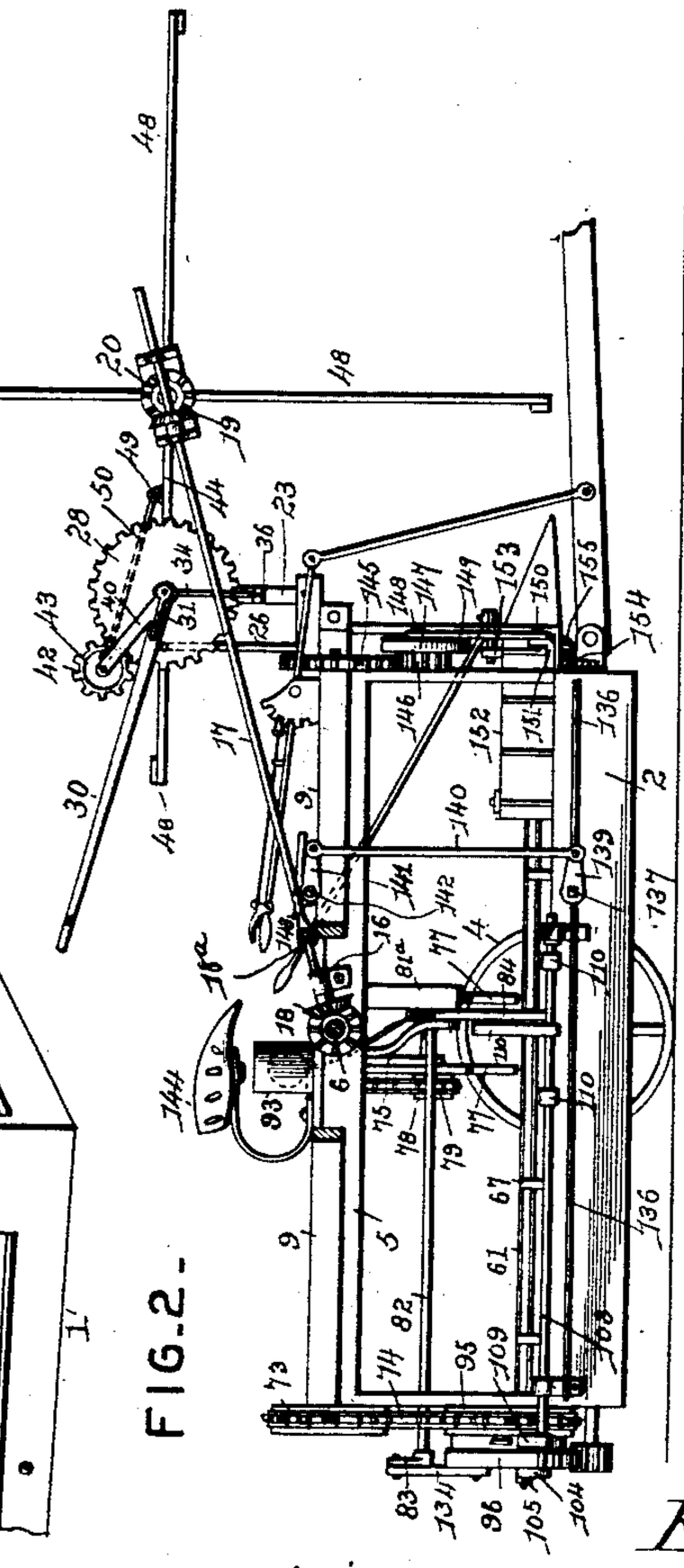

FIG. 8.

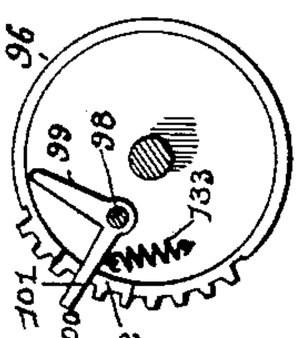

FIG. 7.

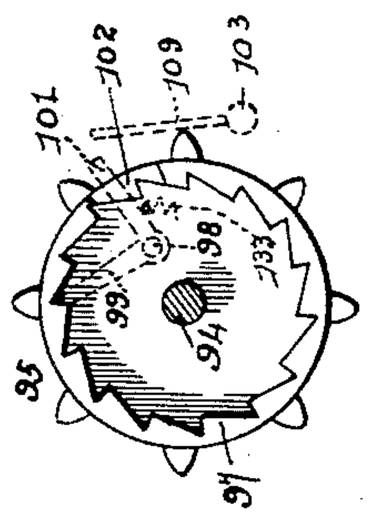

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FIG. 4.

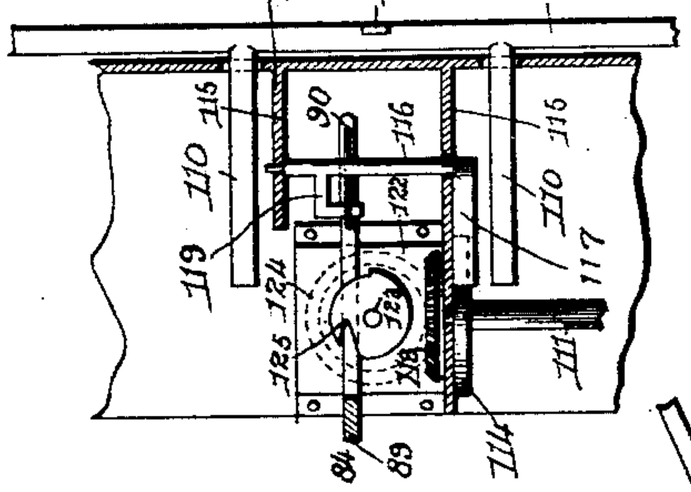

FIG. 6.

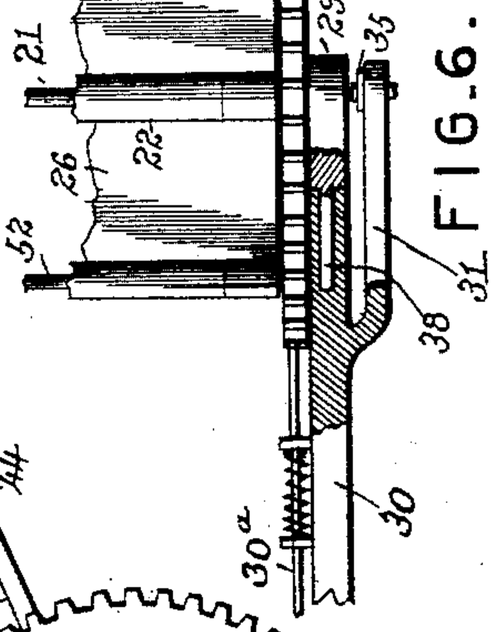

FIG. 3.

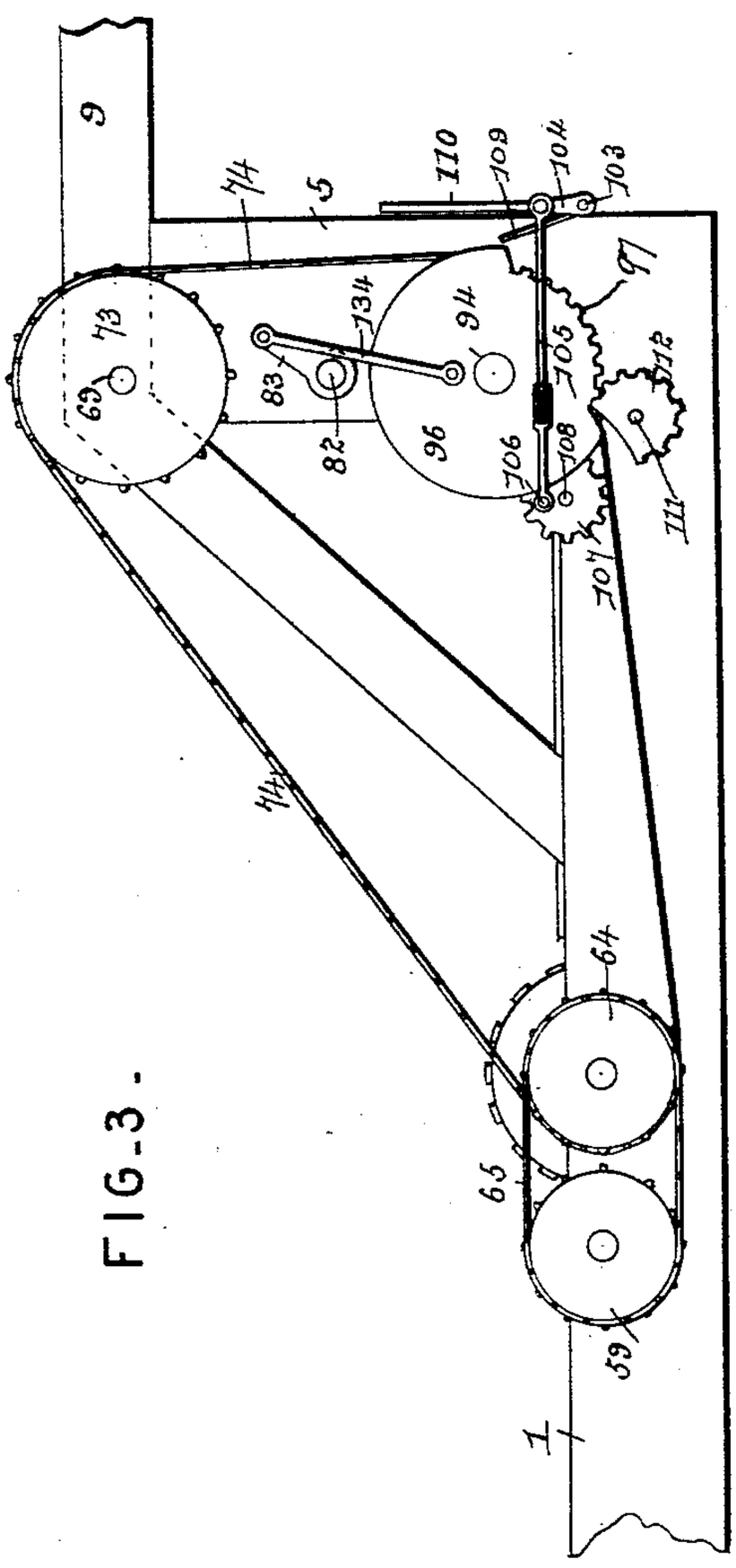

FIG. 5.

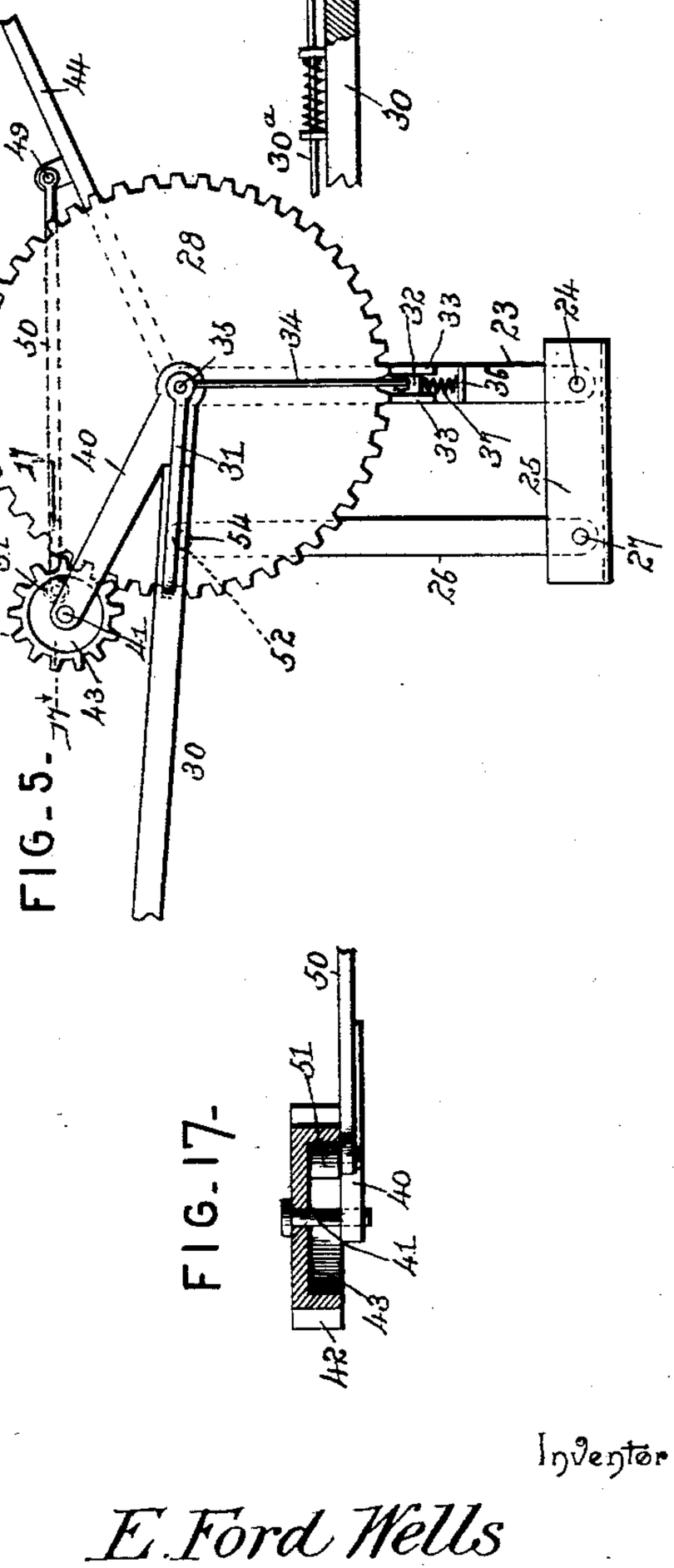

FIG. 17.

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GRAIN BINDING HARVESTER.

No. 520,153. Patented May 22, 1894.

FIG. 11.

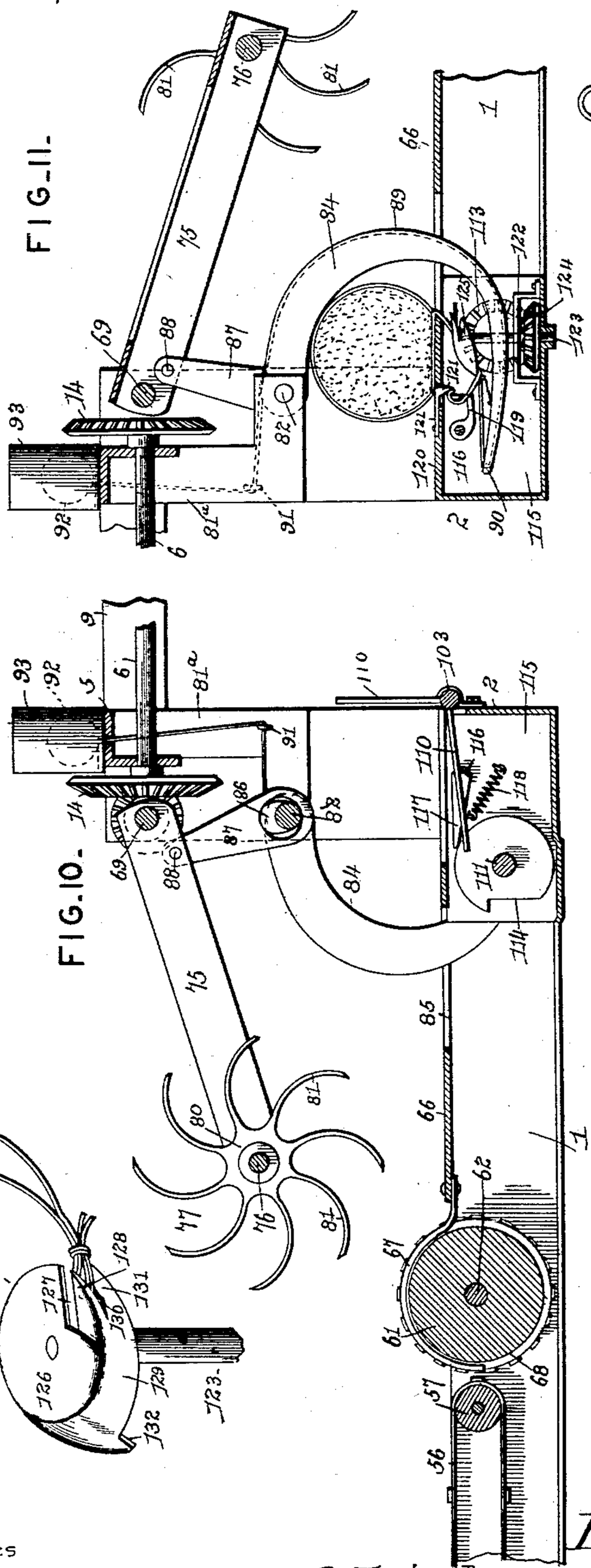


FIG. 15.

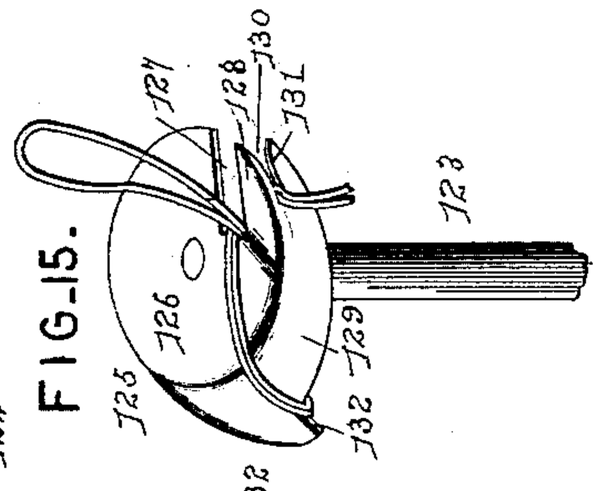


FIG. 14.

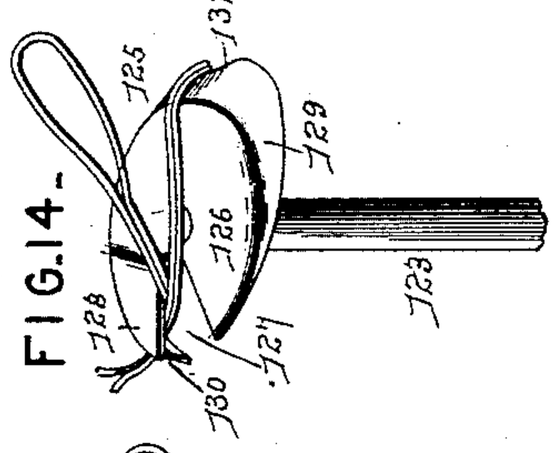


FIG. 10.

FIG. 13.

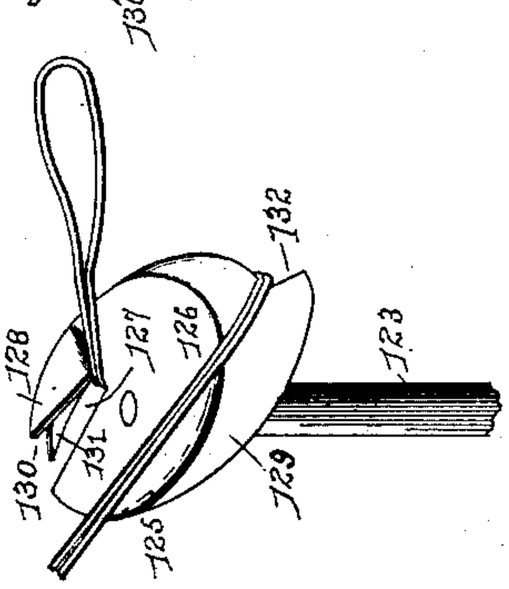
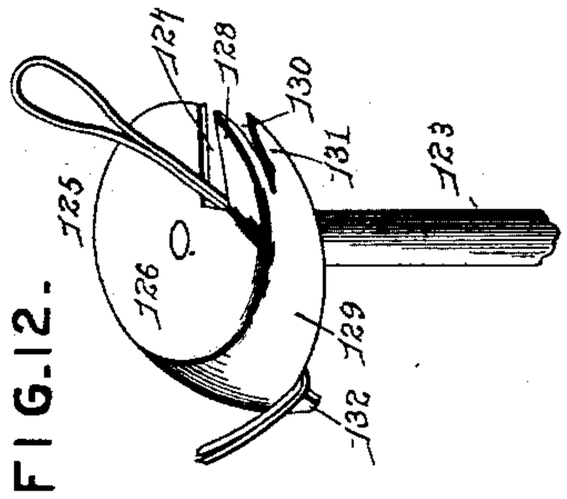


FIG. 16.

FIG. 12.



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UNITED STATES PATENT OFFICE.

ELISHA FORD WELLS, OF LOUISVILLE, KENTUCKY.

GRAIN-BINDING HARVESTER.

SPECIFICATION forming part of Letters Patent No. 520,153, dated May 22, 1894.

Application filed July 15, 1893. Serial No. 480,658. (No model.)

To all whom it may concern:

Be it known that I, ELISHA FORD WELLS, a citizen of the United States, residing at Louisville, in the county of Jefferson and State of Kentucky, have invented a new and useful Grain-Binding Harvester, of which the following is a specification.

My invention relates to improvements in grain-binding harvesters; the objects in view being to provide a machine of this class of cheap, simple, and durable construction, adapted to effectually cut, bundle, and deliver grain and apply the cord thereto, all in one continuous operation; to so arrange the parts as to be under the direct control of the operator and capable of being thrown into and out of operative position with relation to each other; and, furthermore, to simplify the construction and operation of the knotter mechanism.

Various other objects and advantages of the invention will appear in the following description and the novel features thereof will be particularly pointed out in the claims.

Referring to the drawings:—Figure 1 is a plan of a grain-binding harvester constructed in accordance with my invention. Fig. 2 is an end elevation of the same with the main wheel removed and other parts broken away. Fig. 3 is a rear elevation of a portion of the machine illustrating the mechanism employed for operating the knotter. Fig. 4 is a plan view and partial section of a portion of the machine illustrating the knotter. Fig. 5 is an end elevation of the reel-adjusting and operating mechanism. Fig. 6 is a top plan view and partial section of the reel-shaft and the lever for adjusting the same. Figs. 7, 8 and 9 are details of the clutch-mechanism for throwing the knotter mechanism into and out of operation and hereinafter particularly referred to. Fig. 10 is a longitudinal sectional view of a portion of the machine illustrating the needle, the trip-mechanism, and the packing-wheel, the needle being shown as down and the wheel as elevated. Fig. 11 is a view similar to Fig. 10, the bundle being in position and embraced by the needle. Figs. 12, 13, 14, 15 and 16 are perspective views in detail of the knotter-head and illustrating the different steps occurring in tying the knot. Fig. 17 is a sectional view on the line 17—17 of Fig. 5. Fig. 18 is a detail in perspective of the arch at one end of the frame. Fig. 19 is a perspective view in detail of the gripping-finger hereinafter described.

Like numerals of reference indicate like parts in all the figures of the drawings.

Previous to the specific description of the detail mechanism of my invention I shall state that I do not limit my invention to the precise details of construction herein shown and described, but hold that I may make such variations in the said details as may suggest themselves to me during the practical construction and operation of the machine and will not thereby depart from the spirit of my invention or sacrifice any of the advantages thereof.

In carrying out my invention I employ an oblong frame upon which the machine as a whole is mounted, the said frame consisting of the front and rear longitudinal beams 1 and the opposite end beams 2, the same being suitably strengthened and preferably formed of angle-iron in order to lend rigidity and secure lightness of structure. The grain end of the framework has a stub-axle 3 projecting therefrom upon which the ground-wheel 4 is mounted, and the opposite end of the framework supports an inverted U-shaped frame or arch 5 in which is loosely journaled an axle 6, which projects some distance from the end of the frame and has loosely mounted upon its outer end a drive-wheel 7. This axle is journaled at its outer end in a bearing 8, from which extend diagonal braces 9 whose inner ends are bolted to the frame 5. The inner end of the hub of the wheel 7 is provided with ratchet teeth 10 and a ratchet-tooth clutch-collar 11 is splined upon the axle 6 and has connected therewith a hand-lever 12, which, as will hereinafter appear, is within easy reach of the driver when perched upon his seat and may be reciprocated in a guide 13 with which the collar 8 is provided so as to throw the clutch-collar into and out of engagement with the ratchet-teeth of the hub of the drive-wheel and thus communicate motion from said ground-wheel to the axle, or interrupt such motion as may be desired. The inner end of the axle 6 is provided with

a beveled gear 14 at the inner side of the end bar 2 of the framework, and at the opposite side of said end bar is provided with a small beveled pinion 15.

In a suitable bearing there is journaled for rotation a longitudinal shaft 17, which between its ends is provided with a universal joint 18ª, and whose rear end is adjacent to the axle 6 and is provided with a beveled pinion 18 that engages with the beveled pinion 15 of said axle from which it receives motion. The front end of the shaft 17 has slidably mounted thereon a beveled-pinion 19.

The transverse shaft 21 is journaled in bearings 22 which are formed upon the upper end of a standard 23, which standard is pivoted as at 24 to an extension 25 of the front bar 9, which extension is located at the front of the machine. In rear of the standard 23 a second standard 26 is located and has its lower end pivoted as at 27 to the extension 25. Upon the shaft 21 there is mounted rigidly a spur-gear 28, and beyond said spur-gear there is loosely mounted on the end of the shaft the inner bifurcation 29 of a hand-lever 30. The outer bifurcation 31 of said hand-lever is connected with a spring-pressed bolt 32 seated in vertical ways 33 formed in the side of the standard 23, the said connection being effected by a vertical rod 34 whose lower end is pivoted to the bolt and whose upper end is pivoted to the outer bifurcation as indicated at 35 and as best shown in Figs. 5 and 6 of the drawings. A bracket 36 extends from the standard 23 below the bolt and the coiled spring 37 is interposed between the bracket and the bottom of the bolt, and thereby exerts a tendency to press the bolt upward into engagement with a convenient notch or tooth of the spur-gear 28. The inner bifurcation of the lever is provided with a pintle 38, and upon the same is swiveled loosely the handle of said lever, whereby the outer bifurcation which is formed as a part of the handle has an independent or oscillating motion upon the inner bifurcation 29 of the lever, so that the said handle will oscillate for the purpose of depressing the locking bolt out of engagement with the toothed spur gear 28, while at the same time the handle portion of the lever is capable of swinging upon the shaft 21. From the inner bifurcation 29 of the lever there extends upward and rearward an arm 40 which projects beyond the periphery of the spur-gear 28 and is provided at its outer end with a short shaft 41, upon which is loosely journaled a small spur-gear 42, the teeth of which are in constant mesh with those of the gear 28. The face of the gear 42 is provided with an annular recess 43 (see Fig. 17).

Loosely hinged at its inner end upon the shaft 21 is a reel-supporting arm 44 provided at its outer end with bearings 45 in which a rotatable reel-shaft 46 is journaled. The outer end of the reel-shaft is provided with a beveled gear 20 which engages with the gear 19 of the longitudinal shaft 17 before mentioned. The inner end of the shaft 46 carries the usual reel-head 47 from which extend the radial reel-arms 48.

Pivoted as at 49 to the reel-supporting arm 44 is one end of a connecting-rod 50 whose rear end is provided with a bearing stud located opposite the annular recess 43 of the pinion 42 and upon which is mounted an anti-friction roller 51.

At the inner side of the lever 30 there is located a spring-actuated reciprocating locking-pawl 30ª, whose inner end engages with the teeth of the gear 28, and hence locks the mechanism for raising and lowering the reel at any desired point.

In order to raise and lower the reel it is simply necessary to raise and lower the hand lever which causes the pinion 42 to rotate over the periphery of the stationary gear 28, and thus through the medium of the connecting-rod 50 raise and lower the arm 44 that supports the reel-head. In order to swing the reel backward or forward the lever is oscillated so as to cause the locking bolt 32 to disengage with the teeth of the gear 28 and permit of a swinging movement on the standards 23 and 26. The standard 26 is provided at its upper end with a transverse shaft 52, one end of which is connected with the shaft 21 by a pitman or connecting rod 53 and the opposite end of which engages loosely with a perforation 54 with which the gear 28 is provided.

From the grain-side of the machine to a suitable point toward the opposite side there is located a transversely traveling carrier 56, the same being supported upon suitable rolls 57, the shaft 58 of the inner one of which projects in rear of the framework and is provided with a sprocket-wheel 59. This carrier is of the usual construction and is arranged in rear of the usual cutting mechanism 60 at the front of the machine.

Beyond the carrier 56 there is journaled a roll 61, the same being mounted upon a shaft 62, extending parallel with the shaft 58, and carrying inner and outer sprocket-wheels 63 and 64, respectively, at its outer end. The rear sprocket-wheel 64 is connected with the sprocket-wheel 59 of the shaft 58 by a sprocket-belt 65 so that the two shafts 58 and 62 have a motion in the same direction. A platform 66 is supported upon the framework beyond the roll 61 and has its inner edge provided with a series of curved spring tines 67 which overlap the roll 61 and fit in grooves 68 with which the periphery of said roll 61 is provided, the said tines extending between the roll and the inner end of the carrier 56. The surface of the roll 61 is also roughened in any suitable manner, preferably with longitudinal strips arranged superficially thereon, the function of the same being hereinafter apparent.

Journaled transversely in the inverted U-shaped frame 5 is a transverse shaft 69, which is provided at opposite sides of its center with

beveled gears 70 and 71 and at the outer side of the latter is a sprocket-wheel 72. The rear end of the shaft 69 is provided with a sprocket-wheel 73, and the same is connected to the sprocket-wheel 63 of the shaft 62 by a sprocket-chain 74. The sprocket-chain 74, furthermore, connects the wheels 63 and 73 with a third sprocket-wheel hereinafter mentioned as being connected with the knotter mechanism. The beveled gear 71, it will be understood, meshes with the beveled gear 14 of the axle 6 so that motion is communicated from the ground-wheel 7, through the axle 6, the beveled gear 14, the beveled gear 70, which is fast to the shaft 69, and therefore operates the shaft 69, and the sprocket-wheel 73, the sprocket-chain 74, the sprocket-wheel 63, and the shaft 62, which carries the roll 61 and operates the sprocket wheel 64, and the latter through the medium of the belt 65, operates the sprocket-wheel 59 and the carrier-shaft 58.

Loosely hung upon the shaft 69 between the gears 70 and 71 is an arm 75, whose outer or free end has loosely journaled therein a transverse shaft 76 which carries the two packer wheels 77 at each side of the arm. The shaft 76 projects beyond the rear packer-wheel and carries a sprocket-wheel 78, which is connected with the sprocket-wheel 72 of the shaft 69 by means of a sprocket-chain 79. The gear 71 and the sprocket-wheel 72, it will be understood, are loose upon the shaft 69 and receive motion from the axle 6 as operated by the ground-wheel 7, and through the medium of the beveled gear 14 heretofore mentioned, and, as will be obvious, the gears 70 and 71 also operate in reverse directions. Each packer-wheel consists of a central hub 80 and a series of curved spokes or arms 81 radiating therefrom, all as best shown in Figs. 10 and 11 of the drawings.

Journaled in the rear vertical portion of the inverted U-shaped frame 5 and in a central bracket 81^a is the longitudinal needle-carrying rock-shaft 82, which at its outer end is provided with a crank-arm 83 carrying a wrist-pin. The shaft has rigidly mounted thereon adjacent to its bearing 81^a a curved needle 84 which is designed to raise and lower and extend downward through the slot 85 with which the platform 66 is provided. The shaft 82 is provided adjacent to the needle with a cam 86, the said cam loosely receiving the lower end of a link 87 whose upper end is pivoted as at 88 to the arm 75, the said cam being disposed reversely to the needle, so that as the shaft rotates to lower the needle the cam operates and elevates the arm 75 and the packer-wheels carried thereby; and on the other hand, when the needle is elevated the packer-wheels are lowered to an operative position. The convexed side or edge of the needle is provided with a cord-receiving groove 89, and at its point is provided with the usual eye 90. In rear of the needle the bearing bracket 81^a is provided with a cord-guide 91, the ball of cord 92, illustrated in Fig. 10, being supported by the usual cord-can 93 arranged upon the inverted U-shaped frame 5

Extending from the rear vertical portion of the inverted U-shaped frame 5 below the needle-carrying rock-shaft 82 is a stub shaft 94, and mounted loosely upon the same is a sprocket-wheel 95 (see Fig. 7), and a mutilated gear 96 (see Fig. 8). The sprocket-wheel and the gear are hollow and arranged with their recessed sides opposing each other. The inner periphery of the sprocket-wheel 95 is provided with a series of ratchet-teeth 97 (see Figs. 7 and 9), and located in the recess of the gear 96 is a bearing-pin 98 upon which is loosely mounted a pawl 99 having its free end provided with a lateral projection 100 that extends laterally into the recess of the sprocket-wheel, and is designed to engage with the ratchet-teeth thereof. This pawl, as shown in Fig. 8, is bell-crank shaped and has an outer branch 101 which extends through a short slot 102 with which the peripheries of the wheels 95 and 96 are provided.

Journaled in suitable bearings in the inner end-bar 2 of the frame is a transverse rock-shaft 103, the same being provided at its rear end with a crank-arm 104 which is connected to one end of a connecting-rod 105, the other end of said rod being eccentrically and loosely pivoted as at 106 to a mutilated gear 107 which is arranged upon a short stub-shaft 108 that extends from the rear bar 1 of the framework. The shaft 103 is further provided adjacent to the crank-arm 104 with a stop-arm 109 located adjacent to the tail-end of the bell-crank pawl 99 and adapted to intercept the same. In rear of the needle the shaft 103 is provided with right-angularly disposed arms 110 which lie each side of the path of the needle. Below the shaft 94 there is journaled in one of a pair of extensions 115 of the framework a shaft 111 the outer end of which carries a mutilated gear 112 similar to the gear 107. This shaft 111 is provided at its inner end with a beveled pinion 113 and immediately in rear of the same with a cam-wheel 114. In said extensions 115 in one of which one end of the shaft 111 is mounted there is journaled a short transverse rock-shaft 116, which at one end opposite the cam 114 and beyond its bearing in the extension is provided with a finger 117 arranged to ride on the periphery of the cam, and by means of said cam to be raised and lowered. A light coiled spring 118 is secured to the finger and to the adjacent extension 115, whereby the said finger is maintained in contact with the face of the cam. The shaft 116 is provided between its points of bearing with an L-shaped gripping-finger 119 whose free end upon its under side is beveled and which is arranged under a box 120 in which is formed the depressed or curved knife-blade or cutter 121, against whose edge the said finger operates in a manner hereinafter described.

In a bearing-bridge or yoke 122 there is

journaled the vertical knotter-shaft 123, the same being provided at its lower end with a beveled pinion 124 which engages with and is operated by the beveled pinion 113 carried by the inner end of the shaft 111. The upper end of this shaft 123 carries the knotter head or knotter proper, indicated at 125. This knotter-head is constructed of sheet steel preferably, and consists of a flat disk-like top 126 at one side of which there is formed an opening 127 disposed eccentrically with relation to the disk-like top and having its outer portion slightly inclined upward to form a bill 128. From this point around to the opposite side of the head the same is provided with a declining flange 129 which gradually increases in depth from its ends toward its center. Immediately below the bill 128 the flange is provided with a slit or opening 130 which forms a lower bill 131 which extends at a right angle to the bill 128. The lower edge of the declining flange 129 at its widest portion is provided with an abrupt shoulder 132 which is about opposite or in line with the opening 127 heretofore mentioned.

In Figs. 12 to 16 I have illustrated the different steps of forming the knot which will be described in detail hereinafter.

The grain as it falls upon the endless carrier is delivered by the latter to the roll 61, which as before stated, being roughened serves to transmit the grain therefrom and on to the platform 66. When a sufficient quantity of grain has accumulated to cause the shaft 103 to be oscillated by the pressure of the grain against the vertical arm 110 it will be seen that the oscillation of said shaft 103 will cause the stop-arm 109 to be withdrawn from the path of the bell-crank pawl 99. This removal of the stop-arm from the tail-end of the bell-crank pawl causes the latter to engage with the ratchet-teeth 97 of the sprocket-wheel 95, such engagement being caused by the spiral spring 133 employed for the purpose. In this manner the two wheels 95 and 96 are locked together, and the sprocket-wheel 95 being rotated through the medium of the chain 74 heretofore mentioned, causes the mutilated gear 96 to rotate until the pawl is again brought against the stop-arm. During this single rotation of the gear 96 it will be seen that the same will operate upon the mutilated pinions 112 and 107 successively. Previous to the operation upon the gear 112, the gear 96 through the medium of a pitman 134, which connects the same pivotally with the crank arm 83 of the needle-carrying shaft, rocks the needle shaft 82 causing the needle to swing down and embrace the bundle, carrying the cord thereunder, and at the same time, as before stated, the cam 86 of the shaft 82 causes the packer-wheels, which have packed the grain, to elevate out of the way. The leading end of the cord, it will be understood, passes under the knotter-head at the side of the shoulder 132, and is caught between the finger 119 and the box 120, to facilitate which engagement the aforesaid finger 119 is beveled upon its under side so as to pass by the cord and below the same when the finger is depressed, and to engage under said cord when said finger is elevated. After the needle has made its descent and thus carried the cord around the bundle, the mutilated gear 96 operates upon the pinion 112, giving the latter a rotation, and thus through the medium of its shaft 111 and its gear 113, imparts motion to the knotter shaft 123 and its pinion 124, thus causing the knotter-head to make one revolution during which the knot is formed. The first portion of the revolution of the knotter-head brings the cord to the position shown in Fig. 13 so that the ends are reversed, a further revolution causes the free ends of the cord to be engaged by the slit 130 above the bill 131, as shown in Fig. 14. At this point the finger or grasper 119 is operated or elevated so as to draw the cord against the knife or cutter 121, and proceeding upward clamps the cord back of its cut portion against the under side of the box 120. The twister it will be understood, continues in its rotation, which brings the cord to the position shown in Fig. 15 and where the knot is tied and is about to be tightened and slipped off of the bills 128 and 131. In Fig. 16 I have shown the knot as tightened and slipped off of the knotter, the removal of the knot being caused by the horizontal discharge arms 110, which is operated positively by means of the pitman 105, which is moved through the rotation of the gear 107, which, as before stated, is operated subsequent to the gear 112 of the shaft 111. This movement of the shaft 103 serves to discharge the bundle upon the bundle-carrier 136.

The bundle-carrier 136 is pivotally supported upon a shaft 137, the inner end of which is journaled in the framework of the machine, and the outer end of which is journaled in a bearing 138 on one of the braces 9. The end of the shaft is provided with a crank-arm 139, which is connected by a pitman 140 with a crank-arm 141, formed on the outer end of a transverse operating shaft 142, which extends inward over the arched frame 5 and is provided with a foot-rest or treadle 143. This treadle is adjacent to a seat 144, which is supported upon the arch 5.

The shaft 69 at its front end is provided with a spur gear 145 which engages with a small pinion 146 journaled on a stub-shaft immediately below the shaft 69. The outer face of this pinion has secured thereto a disk 147 which is provided with a wrist 148 to which a connecting-rod 149 is loosely pivoted. The lower end of this connecting rod is pivoted as at 150 to the end of the reciprocating knife or cutter 151, which is located at the front of the machine below the reel and in advance of the carrier 56, as is usual.

At the inner corner of the machine there is located the usual canvas butter 152, which performs its usual function, and whose shaft 153, from which it is hung, receives its mo-

tion from a beveled pinion 154 located on the front end of the shaft 62 that carries the roller 61, which pinion engages with a pinion 155 located on the lower end of said shaft 153.

From the foregoing description in connection with the accompanying drawings, it will be seen that I have provided a grain-binding harvester complete, the same being of cheap, simple, and durable construction and easy of operation; that I have provided a knotting mechanism that is extremely simple, and in which the knotter is continuously rotated and devoid of any extraneous means for pushing the knot therefrom after being formed; and, furthermore, that I avoid the necessity of employing a tucker for inserting the twine in the throat of the knotter, but, to the contrary, said knot automatically engages therewith during its continuous rotation. It will furthermore be seen that the extreme simplicity and comparatively few number of parts composing the invention render the structure exceedingly light for a binder, whereby I am enabled to operate the same successfully with two horses. I furthermore, avoid the employment of back gearing for diminishing the speed of the mechanism that conveys motion to the knotter, and yet at the same time secure the increased speed necessary for a successful operation of the cutters.

Having described my invention, what I claim is—

1. The combination with the extended axle of a grain-binding harvester and its ground-wheel, of diagonal braces for the axle, and an intermediate collar, a depending bearing-arm formed upon one of the braces, a transverse shaft arranged in the bearing-arm and in the end of the framework, a bundle-carrier carried by the shaft, a crank-arm at the outer end of the shaft, an operating rocking shaft arranged above the crank-shaft and provided with a foot-treadle at one end, and a crank at the opposite end, and an intermediate connecting-rod between the two cranks, substantially as specified.

2. The combination with the frame of a grain-binding harvester, of an inverted U-shaped frame at one end thereof, an axle projecting from the U-shaped frame, a ground-wheel for the axle, a bearing-collar arranged at the outer end of the axle, and diagonal braces, of a bundle-carrier pivoted below the axle and supported by the braces, and means for dumping the carrier, substantially as specified.

3. In a grain-binding harvester, the combination with the framework, a transverse shaft journaled therein, an arm loosely mounted on the shaft and provided at its outer end with a transverse shaft, packing-wheels arranged on the ends of the shaft, a sprocket-wheel arranged beyond one of the packing-wheels, a sprocket-wheel arranged on the transverse shaft, and means for giving motion to said shaft, of a needle-carrying shaft arranged below the transverse shaft, a needle carried thereby, a cam on the needle carrying shaft, a link embracing the cam and pivoted to the packing-wheel carrying shaft, and means for operating said needle-carrying shaft, substantially as specified.

4. In a grain-binding harvester, the combination with the platform, the cutting-mechanism arranged in front thereof, the transverse shaft 69 having the loose gear and sprocket-wheels 71 and 72, and the tight gear 70, the spur-gear 145 at one end of the same, the axle 6, the gear 14 thereon between the gears 70 and 71 the disk 147 and gear 146 below the spur-gear and engaging with the latter, a pitman-rod 149 between the knives of the cutter and disk, of the arm 75 loosely hung on the shaft 69, the transverse shaft 76 arranged in the free end of the arm, the packing-wheels 77 arranged on the ends of the shaft 76, the sprocket-wheel 78 arranged upon the packing-wheels, the sprocket-chain 79 connecting the wheels 78 and 72, the carrier-mechanism, and the needle, and knotter-mechanism, and means for conveying motion thereto from the shaft 69, substantially as specified.

5. In a grain-binding harvester, the combination with the vertical knotter-shaft carrying the knotter 125, the same consisting of a concaved disk-like head 126 provided at one side with a tangential-slot 127 and from the same to a point substantially opposite provided with a declining flange 129 having the abrupt shoulder 132 about midway the same, and at one side of the slot 127 having the V-shaped slot 130, the slots 127 and 130 forming the two bills 128 and 131, the same being arranged at an angle to each other, and the bill 128 being slightly elevated, and means for rotating said shaft in one direction, substantially as specified.

6. In a grain-binding harvester, the combination with the pivoted needle, the box arranged below the same and having the depending knife, the transverse shaft 116 journaled in the box in rear of the knife and provided with the fingers 117 and 119, the latter being in rear of the knife and adapted to operate thereagainst, the spring 118 for depressing the finger 117, the transverse shaft 111, the cam 114 carried thereby, and means for operating the shaft 111, of the knotter-shaft 123 arranged at the inner end of the shaft 111, the gear 124 on the knotter-shaft, the gear 113 on the end of the shaft 111 for engaging the gear 124, and the herein described knotter carried by the shaft 123, substantially as specified.

7. In a grain-binding harvester, the combination with the stub-shaft 94, the sprocket-wheel 95, the gear-wheel 96, each being recessed and arranged face to face, the sprocket-wheel having its inner periphery provided with ratchet-teeth, a pin on the inner side of the gear-wheel, a bell-crank lever arranged therein, a spring for elevating the inner

branch thereof into engagement with the teeth of the sprocket-wheel, said lever having one end extended laterally through a slot in the wheel 96, the transverse rocking-lever 103 having the arms 110, and stop-arm 109 arranged in the path of the bell-crank lever, the vertical knotter-shaft having the beveled gear thereon and carrying a knotter, the transverse shaft 111 having the gear 113 meshing therewith, and the outer mutilated gear 112 engaging with the gear 96, the transverse shaft 108 having the mutilated gear 107 arranged thereon in rear of the gear 112, the crank-arm 104 on the end of the shaft 103, and the intermediate connecting-arm 105 between the crank-arm and the gear 107, substantially as specified.

8. In a grain-binding harvester, the knotter 125, consisting of a concaved disk-like head 126 provided at one side with a tangential slot 127 and from the same to a point substantially opposite provided with a declining flange 129 having the abrupt shoulder 132 about midway the same, and at one side of the slot 127 having the V-shaped slot 130, the slots 127 and 130 forming the two bills 128 and 131, the same being arranged at an angle to each other, substantially as specified.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

E. FORD WELLS.

Witnesses:
J. H. SIGGERS,
E. G. SIGGERS.