No. 614,466. Patented Nov. 22, 1898.

P. HANSON.

GRAIN BINDER.

(Application filed May 31, 1895.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1

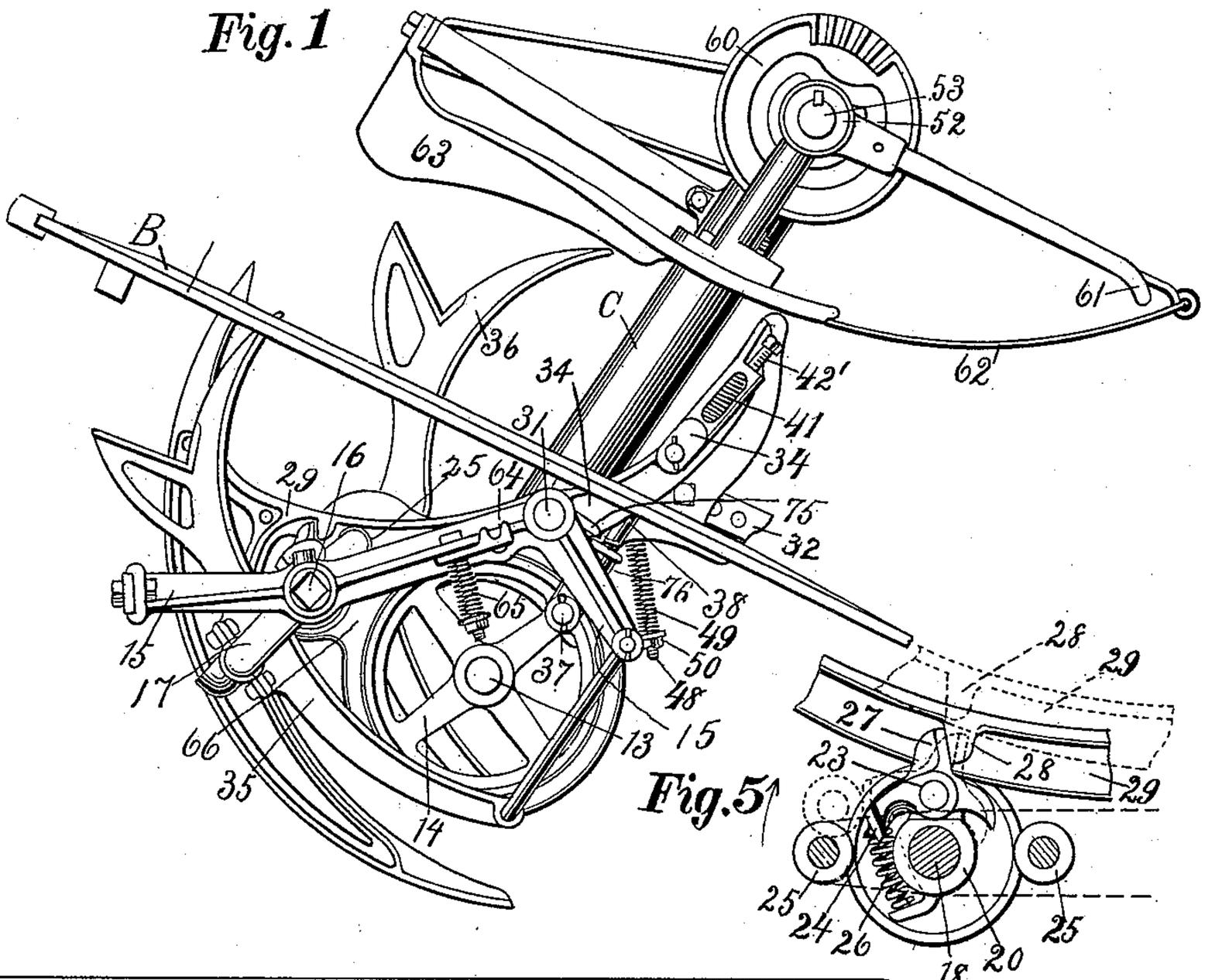


Fig. 5

Fig. 2

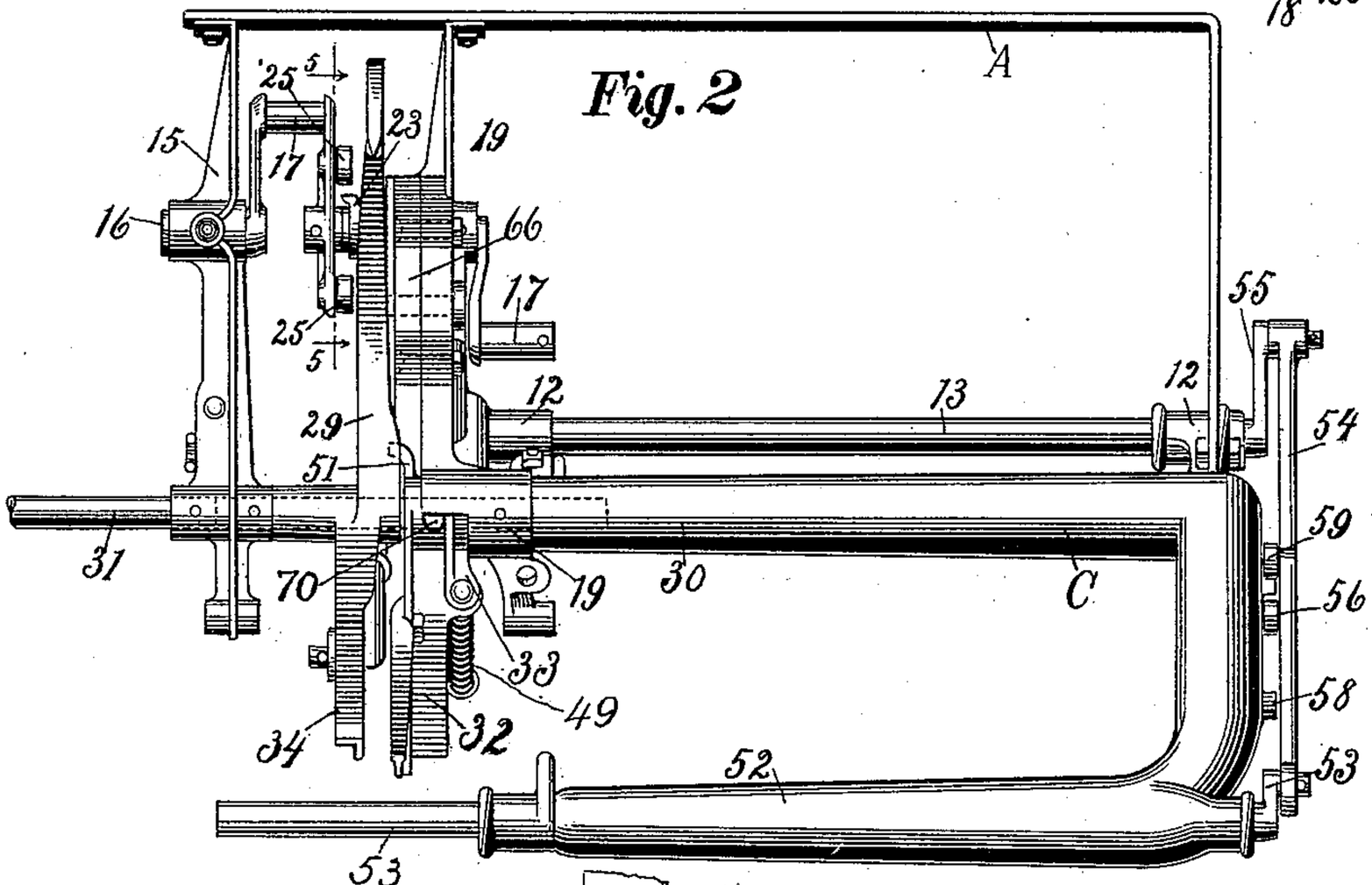
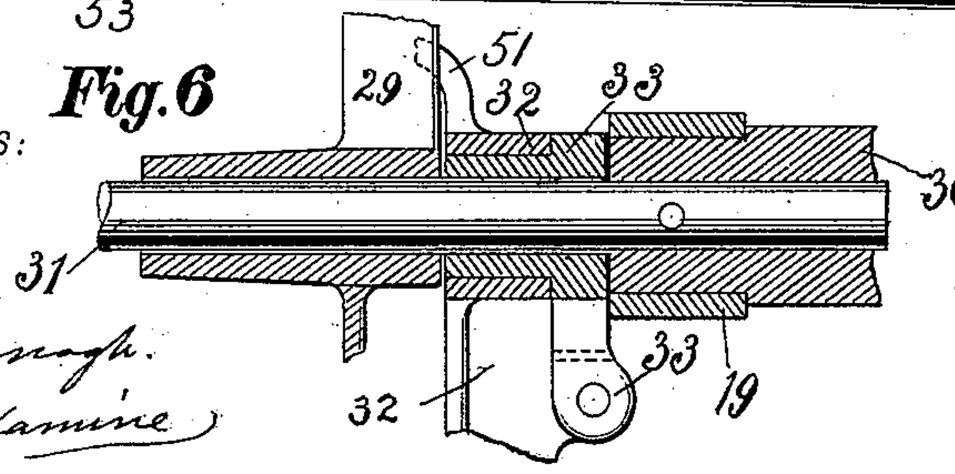


Fig. 6



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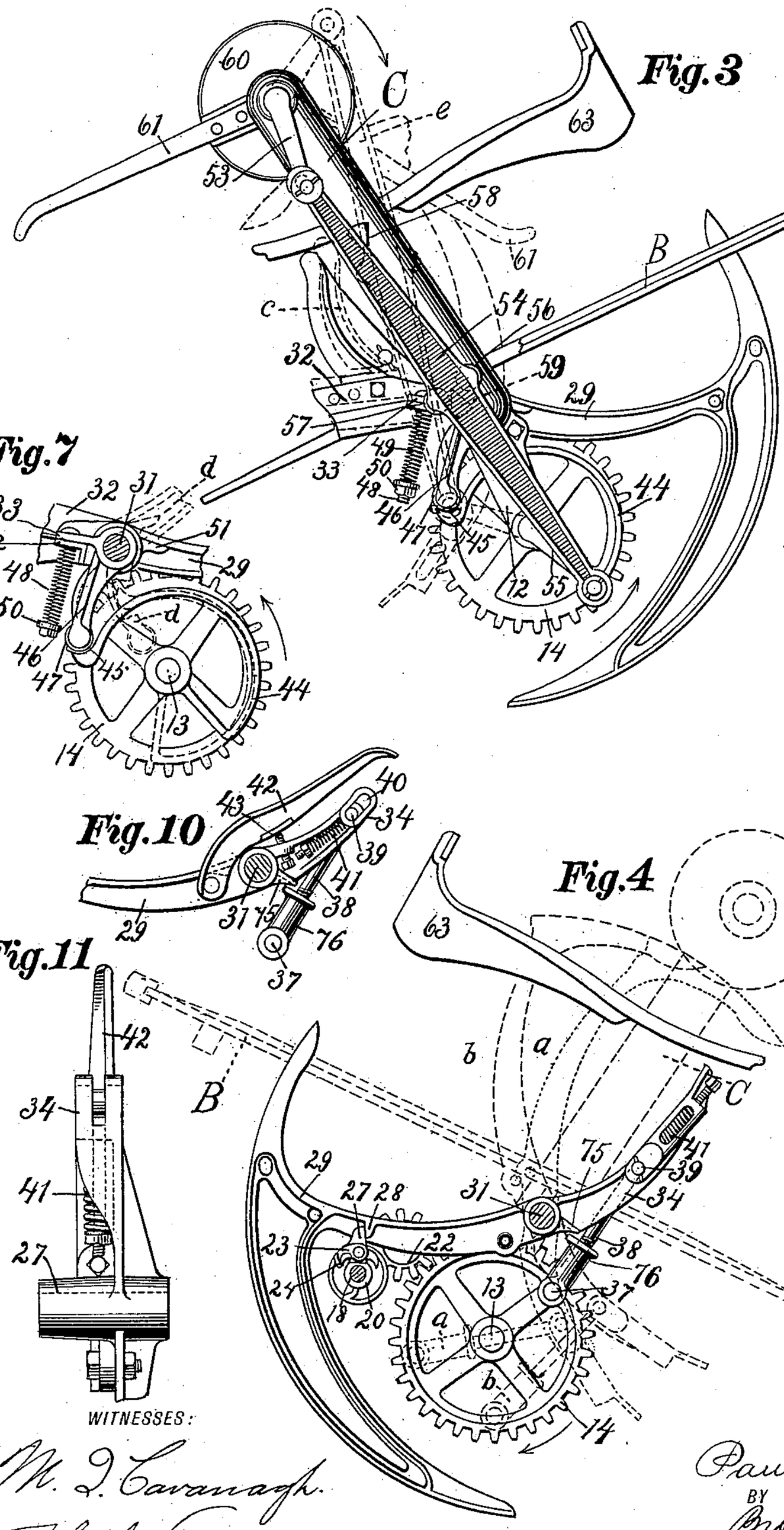

Fig. 3

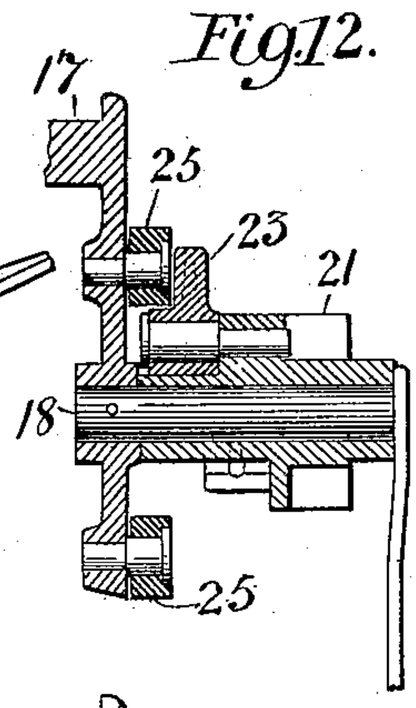

Fig. 12.

Fig. 7

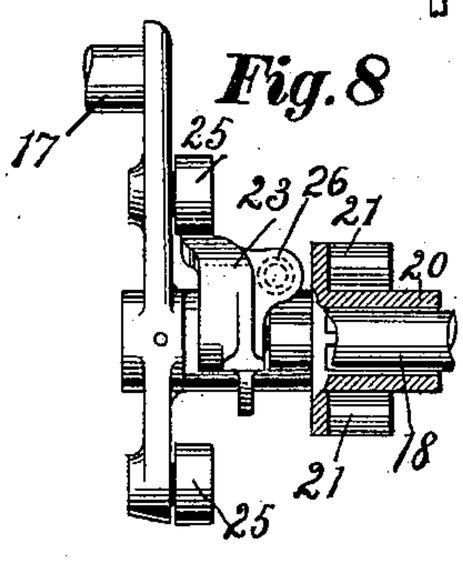

Fig. 8

Fig. 10

Fig. 4

Fig. 11

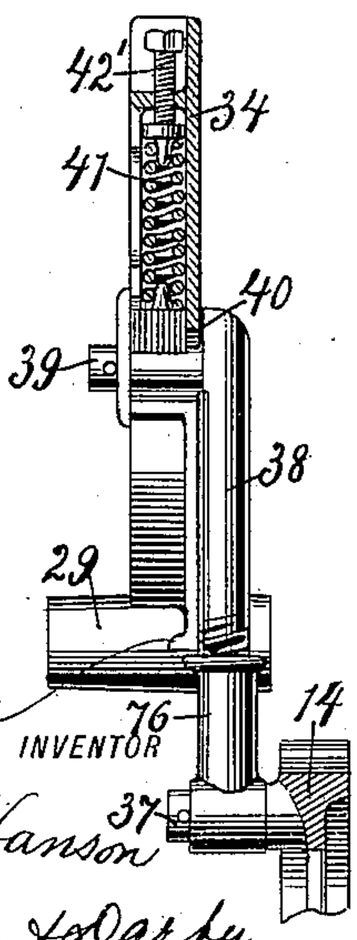

Fig. 9

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UNITED STATES PATENT OFFICE.

PAUL HANSON, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE DEERING HARVESTER COMPANY, OF SAME PLACE.

GRAIN-BINDER.

SPECIFICATION forming part of Letters Patent No. 614,466, dated November 22, 1898.

Application filed May 31, 1895. Serial No. 551,142. (No model.)

To all whom it may concern:

Be it known that I, PAUL HANSON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Grain-Binder, of which the following is a specification.

This invention relates to grain-binders, and is designed in some respects as an improvement upon the structure set forth and claimed in my prior patent, No. 510,174, dated December 5, 1893; and its object is to simplify and improve the construction of the same, to reduce the number and cost of the operating parts, and to make the same more positive, direct, and effective in action.

The invention consists, substantially, in the construction, combination, location, and relative arrangement of parts, all as will be more fully hereinafter set forth, as shown in the accompanying drawings, and finally more specifically pointed out in the appended claims.

Referring to the drawings and to the various views and reference-signs appearing thereon, Figure 1 is a view in side elevation of a construction embodying my invention. Fig. 2 is a plan view of the same. Fig. 3 is a side elevation taken from the side opposite that shown in Fig. 1 and illustrating the means for driving the knotter-operating shaft, a displaced position of the several parts being indicated in dotted lines. Fig. 4 is a detail view, parts in vertical section, showing the driving-gears and method of mounting and actuating the needle, a displaced position of the several parts being indicated in dotted lines. Fig. 5 is a sectional detail view taken on the line 5 5, Fig. 2, showing the spring-pressed trip-dog, a displaced position of the several parts being indicated in dotted lines. Fig. 6 is a sectional detail view showing the stud-support, upon which is pivotally mounted the needle, the compressor-bar, and the compressor-lever. Fig. 7 is a sectional detail view showing the cam for actuating the compressor-lever, a displaced position of the parts being indicated in dotted lines. Fig. 8 is a detail view, partly in section and parts being broken away, showing the stud forming the bearing for the packer-cranks and the drive-pinion and clutch mechanism. Fig. 9 is a detail view, partly in section, of the end of the needle constituting the clutch-tripping arm and the clutch connection for actuating said needle. Fig. 10 is a detail view of a slightly-modified form of needle-arm for tripping the clutching mechanism. Fig. 11 is a detail view, in bottom plan, of the construction shown in Fig. 10. Fig. 12 is a detail sectional view of the mechanism shown in Fig. 8, taken longitudinally through shaft 18 and showing the relation of the sleeve, clutch-dog and pinion, and rollers on the packer-crank.

The same reference-signs are employed throughout the several views to designate the same parts wherever they occur.

In the drawings reference-sign A designates the frame of the machine, B the binder-deck, and C the binder-frame or housing. In suitable depending hangers 12 12, beneath the binder-deck, is journaled the main or operating shaft 13, arranged to extend transversely across the binder-frame attachment. Carried by shaft 13, at one end thereof, is the main operating gear-wheel 14, adapted to actuate the several devices, as hereinafter more fully explained.

In a brace rod or arm 15 is journaled one end of the packer-driving shaft 16, (see Fig. 2,) upon which is mounted one arm of the packer-crank 17. The packer-crank shaft is provided with an extension 18, which is journaled in a brace-arm 19 and upon which is mounted to freely slide thereon a sleeve 20, having gear-teeth 21 formed thereon, as shown at Fig. 8, to engage and drive a pinion 22, suitably journaled in the framework adjacent thereto and in position to mesh with and drive the main wheel 14, as shown. (See Fig. 4.)

A clutch-dog 23 is pivotally mounted upon sleeve 20 to move therewith around extension 18, but capable of independent rocking about its own pivot, as will be readily understood. Dog 23 is provided with an arm or toe 24, adapted when said dog is suitably rocked to be thrown into the path of travel of the rollers or suitable engaging devices 25, carried by the packer-crank. A spring 26 (see Fig. 5) is arranged to act upon clutch-dog 23 and con-

stantly tends to tilt said dog about its pivot and in position for the arm or toe 24 thereof to be engaged by the roller 25 of the packer-crank, thereby rotating the sleeve 20 upon its supporting-stud 18, and hence actuating main gear-wheel 14 through gears 22 and 21.

Clutch 23 is provided with a lug 27, arranged to be engaged by a lug 28, formed on the needle 29, when the parts are brought into suitable position therefor, thereby causing clutch-dog 23 to be rocked in a direction opposed to the action of spring 26, and hence in a direction to cause the toe 24 of said dog to move out of the path of travel of the rollers 25 upon the packer-crank, and hence effecting a stoppage of rotation of the main gear 14 and its driving-gears, as will be more fully hereinafter explained.

In the lower arm of the binder-frame C is mounted a stud 31, which serves as a support for one end of braces 15 and 19 and upon which are sleeved the needle 29, the compressor-bar 32, and the compressor-lever 33. (See particularly Figs. 1, 2, and 6.) Needle 29 is provided beyond or stubbleward of its pivotal support with an upturned extension 34, which, when said needle occupies its retracted position beneath the binder-deck, as indicated in full lines in Fig. 4, is arranged in the path of travel of the grain while being acted upon by the packers 35 36 and serves as a trip whereby the needle may be rocked upon its pivot to release the engagement between lug 28, formed on the needle 29, and lug 27, formed on clutch-dog 25, thereby permitting spring 26 to throw said dog into position to be engaged by the packer-crank, thereby rotating sleeve 20, and hence actuating the main wheel 14. Thus it will be seen that the clutch and gearing for operating the parts concerned in the binding operation and also the needle are located between the packer-cranks. This arrangement and relative location of parts brings the clutch directly beneath or back of the needle, and hence enables me to utilize the needle as a means of tripping the clutch by mounting or forming the stop 28 directly on the back of the needle. Moreover, by the construction and arrangement above described I am enabled to locate the driving-gearing about the middle of the binder-deck instead of at the edge thereof, thus securing greater compactness and a more direct connection between the driving and driven parts. Again, by reason of the arrangement above described any loose straws of grain upon the binder-deck are prevented from falling or being drawn through the slot or opening in which the needle operates, thus preventing clogging or interference with the gearing underneath. This is true for the reason that such gearing is located within the arc described by the heel extension of the needle-point, and hence this extension forms a stop or cut-off for the incoming grain when the needle is advanced to its work, but when the needle is fully retracted it overlies the clutch and gearing, and hence protects these parts from loose straws of the grain.

A crank-pin 37 is formed or suitably mounted on the face of main gear 14, and pivotally mounted thereon is a link 38, having a crank-arm 39 at the opposite end adapted to be received in an elongated slot 40, formed in the trip extension 34 of the needle. By this construction the needle is rocked about its pivot-stud 31 when the main wheel 14 is actuated, and by reason of the slot 40 the needle is permitted a slight movement about its pivot-stud independent of the driving-link 38. This slight independent movement enables the needle to rock to disengage lugs 27 28, thereby utilizing the needle itself as the trip-lever. A spring 41 is provided and arranged to bear at one end upon the crank-arm 39 of the driving-link 38 and at the opposite end upon trip extension 34 of the needle, and hence normally tends to hold the needle against movement thereof independently of the operating-link 38. By suitably regulating the tension of spring 41, as by means of adjusting-screw 42′, (see Fig. 9,) the degree of pressure of the grain necessary to effect a tripping of clutch-dog 23 may be regulated.

From the foregoing description it will be seen that when the main drive-wheel 14 is actuated the needle is advanced to its work through the driving-link connection between said wheel and the extension of the needle stubbleward of its point of pivotal support. By reason of the relative arrangement of crank-pins 37 and 39 the needle is advanced to its work from its normal position of rest, as shown in full lines in Figs. 1 and 4, when the lugs 27 and 28 are disengaged—that is, during the rotation of the wheel 14 through the first quarter of its revolution in the direction indicated by the arrow in Fig. 4; but the speed of advancement gradually diminishes during the second quarter of the revolution of said gear-wheel when the needle comes to rest in its extreme advanced position. This point is reached when the driving-link 38 occupies the position indicated in dotted lines, as at A, Fig. 4, and in the operation of the machine during this period of rest of the needle the tieing and knotting operations are accomplished. Further rotation of drive-gear 14 causes the needle to begin to recede, the movement being slow at the beginning by reason of the relative positions of cranks 37 and 39; but as the main drive-gear 14 continues upon its rotation through the last quarter thereof the crank 37 approaches more nearly the point of pivotal support of the needle, and hence, acting through a shorter arm of leverage, effects a more rapid withdrawal of the needle to its normal position beneath the binder-deck. It will also be seen that the leverage obtained by driving-link 38 upon the extension of the needle is greatest during the second quarter of the revolution of the main

drive-gear 14—that is, during the travel of the link from the position thereof indicated by the dotted lines *b*, Fig. 4, to the position indicated by dotted lines at *a* in Fig. 4—thereby exerting the greatest power upon the needle during this movement. This result is secured by reason of the substantially right-angular relation maintained between the link and needle extension. This is an important feature of construction, for during this period of movement the needle is acting to compress the bundle of grain, and hence requires the greater power to advance it to its extreme forward movement. The slow movement of the needle in its initial retracting movement, secured through the construction and arrangement of parts as above explained, is important, for thereby the natural tendency of the bundle of grain to expand when the pressure exerted thereon is relaxed is held in curb, and the gradual expansion permitted by the gradual withdrawal of the needle enables the knot to be drawn tight in the binding-cord, thereby making a tighter bundle with less compression than is required in ordinary grain-binders, whereas a rapid retraction of the needle and a consequent rapid expansion of the bundle frequently causes the knot of the binding-twine to run out to the end of the twine, thereby making a loose bundle.

In Figs. 10 and 11 I have shown a construction for accommodating the needle as a clutch-tripping lever to varying sizes of bundles. In this construction I pivot arm 42 upon the shank of the needle and arrange said arm to extend stubbleward of the pivot of the needle and in position to coöperate with the needle extension to engage the stubbleward part of the grain while being formed into a bundle, thereby serving to effect a tripping of the needle, such result being effected by the pressure of the grain upon the extension 34, against which said pivoted arm bears, such pressure being exerted through the pivoted arm, against which the grain directly acts. The position of pivoted arm 42 is adjustable relatively to the extension by means of set-screw 43. In this construction I have shown an extension-spring 41, adapted to act upon crank 39 during the movement of the needle independent of the driving-link 38, instead of a compression-spring, as in the form of spring shown in Figs. 1, 4, and 9.

Upon the face of the main drive-gear 14, opposite to that shown in Fig. 4, is formed a mutilated peripheral cam-flange 44, (see Figs. 3 and 7,) having at one end thereof a circular seat, as at 45, for a purpose presently to be explained. The compressor-lever 33 is sleeved upon stud 31, as shown in Fig. 6, and is arranged thereon closely adjacent to the needle. Said lever is provided with an arm 46, in the end of which is preferably mounted a friction-roller 47, adapted to engage and ride upon cam-flange 44 when gear-wheel 14 is revolved and to be received in the circular seat 45 when said gear-wheel comes to rest. The compressor-bar 32 is sleeved upon stud 31, or, rather, upon the hub of compressor-lever 33, as shown in Fig. 6, and is arranged in close proximity to the needle. The compressor-lever carries a bolt 48, upon which is mounted a spring 49, arranged to bear at one end upon a flange of the compressor-bar and at the opposite end upon an adjustable nut 50, whereby its tension may be adjusted. (See Figs. 3 and 7.) By this construction a yielding connection is secured between the compressor-lever and compressor-bar—that is, the compressor-bar is supported upon a yielding seat. As shown in full lines in Figs. 3 and 7, the parts occupy the position of rest—that is, the position wherein the needle is fully retracted, as shown in full lines in Fig. 4. When, therefore, motion is transmitted to main drive-gear 14 to rotate the same in the direction indicated by arrow in Fig. 7, the roller 47 begins to ride over the surface of the mutilated cam-flange 44, thereby rocking the compressor-lever about stud 31 as a pivot and through spring 48 rocking compressor-bar 32 about its pivot. This point is attained when the needle is approaching its extreme advanced position—that is, when the bundle of grain forming the gavel is being subjected to the greatest pressure. Any resistance to the movement of the compressor-bar to meet the needle, as indicated at dotted lines *c*, Fig. 3, due to the pressure of the bundle of grain, is yieldingly taken up in the spring 49. When the roller 47 reaches the mutilated part of the cam-flange 44, it is released and permits the compressor-bar and compressor-lever to fall back into their retracted position beneath the binder-deck, as indicated by dotted lines *d*, Fig. 7. This point is reached when the bundle has been formed and tied and is being ejected from the machine. The further rotation of main wheel 14 to complete its revolution causes the roller 47 to be raised until it is in position to be received in seat 45. This occurs at the moment gear-wheel 14 has completed its revolution and has come to rest, the compressor-bar occupying its normal position to receive thereagainst from the packers the grain to form the next bundle. Upon the hub of the compressor-bar may be provided a lug 70, (see Fig. 2,) adapted to engage a portion of the frame—as, for instance, a flange of the supporting-sleeve of cross-bar 19. This lug operates to arrest the further movement of the compressor-bar. This resistance to further movement of the compressor-bar is exerted through the compressor-bar and roller 47 upon seat 45 in a direction tending to rotate wheel 14 in its normal direction of rotation. The effect of this construction and arrangement is to take up any lost motion in the several parts and to enable the parts to respond promptly and quickly when the mechanism is put into action.

In order to insure the movement of the needle to effect a tripping of the clutch mech-

anism, I provide the compressor-bar 32 with an arm 51 (see Figs. 2 and 7) and arrange the same to engage the under side of the needle-shank grainward of its pivot. By this provision the movement of the compressor-bar will cause the needle to effect a tripping of the clutch where for any reason the needle fails to respond readily to undue pressure upon extension 34 or pivoted arm 42.

I will now describe the knotter-shaft and ejector-operating mechanism.

In the upper arm 52 of the binder-frame C is journaled the knotter-operating shaft 53, having a crank-arm mounted upon one end thereof, (see Figs. 2 and 3,) to which is pivotally connected one end of a pitman or connecting-link 54, the other end of said pitman being pivotally connected to a crank-arm 55, mounted upon shaft 13. By this construction rotary motion is imparted to shaft 53 from shaft 13 through said crank-arms and pitman or connecting-rods. Carried upon the inner face of pitman 54 and about midway the length thereof are a pair of projections, preferably in the form of friction-rollers 56 57, and formed on or suitably secured to the binder-frame are two lug 58 59, preferably of V shape, with their points presented toward each other and spaced a distance apart corresponding approximately to the length of stroke of the pitman 54. The lugs 58 59 are respectively arranged to be received between the pairs of rollers 56 57 when the pitman arrives at the respective limits of its stroke, and hence when the cranks 53 55 are nearly in line with each other, and thereby act as a fulcrum for pitman 54, about which it may rock to assist the movement of the crank-arms past their dead-centers. Through this mechanism the knotter-operating shaft 53 is given one complete revolution during each revolution of the main drive-wheel 14, and hence once during each cycle of movement of the needle, thereby causing the knotter mechanism 60 to properly perform its function.

Mounted upon and adapted to be actuated by the knotter-operating shaft 53 are the bundle-ejectors 61. (See Figs. 1 and 3.) It will be observed that the relative arrangement of crank-arms 53 and 55 is such that when the knotter-operating shaft has been rocked to the position thereof for the parts to occupy the relative position indicated by dotted lines *e* in Fig. 3, with the ejector-arm 61 at the point where it engages the bundle of grain to eject the same from the machine, the said crank-arms are moving toward parallelism with respect to each other. This is an important feature, for at this point the greatest power is required to drive shaft 53 in order to effect an ejectment of the bundle, and this maximum power is secured through the greater leverage due to the relative positions occupied by the driving-cranks of said shaft.

The stripper-arms 62 and the breastplate 63 may be of the usual or any desirable construction or arrangement.

In Fig. 1 I have shown at 64 a tension-plate for the binder-twine yieldingly held to brace-arm 15 by means of spring 65, the tension of which may be suitably adjusted in any well-known manner.

By providing the pivoted arm 42 free to rock about its pivot as the needle is advanced to its work I avoid the objection of grain-stalks being caught between the extension of the needle-shank and the binder-deck, for in that case only a short extension 34 is provided, merely long enough to secure proper leverage for driving-link 38 to rock the needle about its pivot.

In order to prevent the stalks of grain from being caught by the gear-teeth on the train of driving-gears or of clogging up the driving mechanism, I preferably inclose the train of driving-gears in a casing 66. (See Fig. 2.)

A suitable lug 75 is formed on the extension 34 of the needle and is arranged adjacent to the hub of the needle and in position to be engaged by a casting 76, into which the driving-link 38 is adjustably screwed, just before the gear-wheel 14 completes its revolution. This engagement occurs, therefore, when the needle has nearly reached its extreme retracted position. By this construction the needle is positively forced home to insure the engagement of drive-dog 23 with the lug 28 upon the needle. The gear 14 rotates a sufficient distance after the engagement above referred to between casting 76 and lug 75 to carry said casting sufficiently beyond or clear of said lug, thereby permitting the needle to be rocked about its pivot independently of its driving-link 38 to effect a tripping of the drive clutch-dog at the beginning of the next cycle of movement of the mechanism.

The operation of the machine will be clearly and fully understood from the foregoing description.

Many variations in the details of construction and arrangement would readily suggest themselves to persons skilled in the art and still fall within the spirit and scope of my own invention. I do not desire, therefore, to be limited or restricted to the exact details of construction and arrangement shown and described; but, having explained the object and nature of my invention and a form of mechanism embodying the same and having explained the function, construction, and mode of operation of the same,

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In a grain-binder, a framework, a stud mounted therein, a needle loosely mounted to rock upon said stud and having an integral extension arranged to project beyond said stud and into the path of the grain while being formed into a bundle, mechanism connected to said needle for rocking the same about said stud, said mechanism including a clutch adapted to trip by pressure of the grain upon said extension, as and for the purpose set forth.

2. In a grain-binder, a framework, a stud mounted therein, a needle loosely mounted to rock upon said stud, mechanism connected to said needle for rocking the same about said stud, said mechanism including a clutch, a stop carried by said needle adapted to trip said clutch, said needle adapted to be rocked about said stud by pressure of the grain for tripping said clutch, as and for the purpose set forth.

3. In a grain-binder, a framework, a stud mounted therein, a needle loosely sleeved to swing upon said stud, mechanism connected to said needle for rocking the same about said stud, said mechanism including a clutch whereby it may be thrown into and out of operation, and means actuated by the pressure of the incoming grain for tripping said clutch, in combination with packers and knotting mechanism and a compressing mechanism, as and for the purpose set forth.

4. In a grain-binder, a framework, a needle, means for actuating the same, a packer-shaft journaled in said framework, a pinion loosely mounted on said shaft, a drive-dog pivotally mounted on said pinion and arranged to be moved into and out of the path of the projections on the side of the packer-cranks, said dog arranged in the path of movement of said needle, the needle adapted to periodically engage and release said drive-dog, as and for the purpose set forth.

5. In a grain-binder, a framework, a packer-shaft journaled therein, a pinion mounted on said shaft, said pinion provided with a sleeve, a drive-dog pivotally mounted on the sleeve of said pinion and normally held in position to be engaged by the rotating part whereby said pinion is rotated, a needle, knotting and compressing mechanism, gearing for actuating the same adapted to be driven by said pinion, said drive-dog arranged in the plane of movement of the needle, said needle adapted to periodically lock said drive-dog out of operation with respect to said rotating part, as and for the purpose set forth.

6. In a grain-binder, a needle pivotally mounted and provided with an extension beyond the point of pivotal support thereof, said extension arranged to project above the binder-deck to receive the incoming grain during the formation of the bundle, a gear-wheel, a link pivoted upon the face of said gear-wheel and yieldingly connected to said extension, and means for driving said gear-wheel, as and for the purpose set forth.

7. In a grain-binder, a needle pivotally mounted and provided with an extension beyond the point of pivotal support thereof, said extension arranged to project above the binder-deck and having an elongated slot therein, a gear-wheel, a link pivoted at one end upon said gear-wheel and having the opposite end thereof adapted to be received in the elongated slot in said extension, and means for driving said gear-wheel, as and for the purpose set forth.

8. In a grain-binder, a needle provided with a slotted extension beyond its point of pivotal support and arranged to project above the binder-deck, a gear-wheel, a link pivoted at one end upon the face of said gear-wheel and having the opposite end thereof adapted to be received in the slot in said extension, a spring arranged to bear upon said link tending to maintain the same at the limit of said slot and means for actuating said gear-wheel, as and for the purpose set forth.

9. In a grain-binder, a needle provided with a slotted extension beyond its point of pivotal support and arranged to project above the binder-deck, a gear-wheel, a link pivoted at one end upon the face of said wheel and having the opposite end thereof adapted to be received in the slot in said extension, a spring arranged to bear upon said link tending to maintain the same at one limit of movement thereof, means for adjustably regulating the tension of said spring, and means for actuating said gear-wheel, as and for the purpose set forth.

10. In a grain-binder, a needle formed with a slotted extension, a gear-wheel, a link pivoted at its respective ends thereof in the slot in said extension and to the face of said gear-wheel, a lug formed on said needle, drive mechanism for said gear-wheel including a clutch, said clutch arranged directly back of said needle and adapted to be tripped by the lug on said needle, as and for the purpose set forth.

11. In a grain-binder, a framework, a drive-gear, a cam-flange formed thereon, a stud mounted in said framework, a needle mounted to rock thereon, a compressor-bar also mounted to rock upon said stud, an arm arranged to be engaged and rocked by said cam-flange, connections between said arm and the compressor-bar whereby said compressor-bar is rocked, said compressor-bar provided with a projection arranged to engage the under side of said needle, a gearing for periodically rotating said drive-gear, said gearing including a trip mechanism arranged in the path of movement of the needle and adapted to be engaged and released by said needle, as and for the purpose set forth.

12. In a grain-binder, a needle, a support upon which said needle is pivotally mounted, said needle provided with an extension arranged to project beyond the point of pivotal support and above the binder-deck, an arm pivotally mounted on said needle and arranged to coöperate with said extension, a link connected to said extension for operating the needle and a gear-wheel for actuating said link, as and for the purpose set forth.

13. In a grain-binder, a needle, a support upon which said needle is pivotally mounted, said needle provided with an extension arranged to project beyond its point of pivotal support and above the binder-deck, and an arm pivotally mounted on the needle and arranged to coöperate with said extension,

and means for adjusting the position of said arm with reference to said extension, as and for the purpose set forth.

14. In a grain-binder, a framework, a stud mounted therein, a compressing mechanism comprising a compressor-bar and a compressor-lever, said bar and lever mounted for independent rocking movement upon said stud, a needle also mounted to rock upon said stud, said bar provided with an arm arranged to engage said needle, a drive-gear having a cam-flange thereon arranged to engage said lever, connections between said lever and bar, means for rotating said gear, and a trip for periodically throwing said rotating means into and out of action, said trip arranged in the path of movement of the needle and adapted to be engaged and released by said needle, as and for the purpose set forth.

15. In a grain-binder, a framework, a stud mounted therein, a compressing mechanism comprising a compressor-bar and a compressor-lever, said bar and lever mounted for independent rocking movement upon said stud, a needle also mounted to rock upon said stud, said bar provided with an arm arranged to engage said needle, a drive-gear having a cam-flange thereon arranged to engage and rock said lever, yielding connections between said lever and bar, means for actuating said gear and a trip for periodically throwing said actuating means into and out of action, said trip arranged in the path of movement of the needle and adapted to be engaged and released by said needle, as and for the purpose set forth.

16. In a grain-binder, a framework, a stud mounted therein, a compressing mechanism comprising a needle, a compressor-bar and a compressor-lever, said needle, bar and lever mounted upon said stud for independent rocking movement, a bolt connected to said compressor-lever and arranged to pass through a perforation in said compressor-bar, a spring mounted on said bolt and arranged to bear against said compressor-bar, a main drive-gear having a cam-flange formed thereon adapted to engage and rock the compressor-lever, means for rotating said gear, and a trip for periodically throwing said rotating means into and out of action, said trip arranged in the path of movement of the needle and adapted to be engaged and released by the needle, as and for the purpose set forth.

17. In a grain-binder, a framework, a support mounted therein, a compressing mechanism comprising a needle, compressor-bar and a compressor-lever loosely mounted on said support for independent rocking motion thereon, a gear-wheel having a mutilated cam-flange thereon adapted to engage and rock said compressor-lever, yielding connections between said bar and lever, means for actuating said gear and a trip for periodically throwing said actuating means into and out of action, said trip arranged in the path of movement of the needle and adapted to be engaged and released by the needle, as and for the purpose set forth.

18. In a grain-binder, a framework, a support mounted therein, a compressing mechanism comprising a needle, compressor-bar and a compressor-lever loosely mounted on said support for independent rocking motion thereon, a gear-wheel having a mutilated cam-flange thereon adapted to engage and rock said compressor-lever, said cam-flange provided with a seat at one end thereof adapted to receive said compressor in its normal position of rest, yielding connections between said bar and lever, means for actuating said gear, and a trip for periodically throwing said actuating means into and out of action, said trip arranged in the path of movement of the needle and adapted to be engaged and released by the needle, as and for the purpose set forth.

19. In a grain-binder, a needle having a lug formed thereon, means for driving said needle including a clutch, said clutch adapted to be engaged or tripped by said lug in combination with a compressor-bar provided with an arm arranged to engage said needle, as and for the purpose set forth.

20. In a grain-binder, a framework, a stud mounted therein, a needle loosely sleeved to rock upon said stud, a compressing mechanism also loosely mounted on said framework, a main drive-gear provided with a cam arranged to actuate said compressing mechanism, a link pivotally mounted upon the face of said gear and connected to said needle, and means for periodically rotating said gear, as and for the purpose set forth.

21. In a grain-binder, a framework, a fixed support mounted therein, a needle loosely sleeved to rock upon said fixed support, a compressing mechanism also loosely mounted to rock upon said support, a drive-gear, a link connection between said gear and the needle, a cam-flange formed on said gear and arranged to actuate said compressing mechanism, and means for periodically actuating said gear, including a trip arranged in the path of movement of the needle and adapted to be engaged and released thereby, as and for the purpose set forth.

22. In a grain-binder, a stud mounted therein, a needle pivotally mounted to rock upon said stud, a compressing mechanism, a main drive-gear, link connections from said gear directly to said needle for actuating the latter, connections between said gear and said compressing mechanism for actuating the same, means for actuating said drive-gear including a clutch, said needle adapted to control said clutch, as and for the purpose set forth.

23. In a grain-binder, a framework, a stationary stud mounted therein, a needle loosely sleeved to rock upon said stud, a compressor-bar and a compressor-lever, also loosely sleeved to rock upon said stud independently of each other and independently of said nee-

dle, an arm formed on said bar and arranged to engage said needle, connections between said bar and lever and means for periodically rocking said lever and needle including a trip arranged to be engaged and released by the needle, as and for the purpose set forth.

24. In a grain-binder, a needle, a driving mechanism therefor, a lug formed on said needle and adapted to be engaged by said driving mechanism as it approaches the limit of its action, whereby said needle is positively forced home to its extreme retracted position, as and for the purpose set forth.

25. In a grain-binder, a framework, a needle loosely pivoted therein, said needle provided with an extension beyond the pivotal point thereof arranged to project above the binder-deck and in position to be engaged by the incoming grain, a driving-gear arranged in proximity to the plane in which said needle operates and direct connections between said driving-gear and needle, whereby said needle is operated, as and for the purpose set forth.

26. In a grain-binder, a framework, a needle loosely pivoted therein, said needle provided at its point of pivotal support with an extension arranged to project above the binder-deck and in position to be engaged by the incoming grain, said needle also provided with a stop, a driving-gear arranged in close proximity to the plane in which said needle operates, a driving-link connected at one end to said gear and at the opposite end to said needle, means for driving said gear including a clutch, also arranged in proximity to the plane in which said needle operates, said clutch adapted to be operated by a lug on said needle whereby said gear is thrown into and out of operation, as and for the purpose set forth.

27. In a grain-binder, a framework, a needle pivotally mounted to rock upon said framework, and provided with an extension beyond its point of pivotal support, a drive-gear mounted on said framework and in close proximity to the point of pivotal support of said needle, a link connected at one end to the face of said gear-wheel, and eccentric with respect thereto, said link connected at the other end thereof to said needle extension, the relative arrangement of said gear and the point of pivotal support of said needle being such as to maintain substantially right-angular relation between said link and needle extension during the compression of the gavel by the needle, whereby an increased leverage upon the needle is obtained, and means for actuating said gear-wheel, as and for the purpose set forth.

28. In a grain-binder, a framework, a needle mounted to rock therein, mechanism connected to said needle for rocking the same, said mechanism including a clutch, a stop carried by said needle and arranged to engage said clutch and throw the same out of action, said needle adapted to be rocked by the pressure of the incoming grain for moving said stop out of engagement with said clutch, as and for the purpose set forth.

29. In a grain-binder, a framework, a needle mounted to rock therein and having an extension beyond its point of pivotal support and arranged to project above the binder-deck, a gear-wheel, a link pivotally connected at one end to said gear-wheel and eccentrically with reference to the axis of the rotation thereof and yieldingly connected at its opposite end to said needle extension, whereby a slight relative movement of said needle with respect to said link may be secured, means for rotating said gear-wheel, including a clutch and a stop carried by said needle for controlling said clutch as and for the purpose set forth.

30. In a grain-binder, a framework, a needle mounted to rock therein and provided with a slotted extension beyond its point of pivotal support and arranged to project above the binder-deck, a gear-wheel, a link pivotally mounted at one end upon the face of said gear-wheel and eccentrically with respect to the axis of rotation thereof and loosely connected at the opposite end thereof in the slot in said needle extension whereby a slight relative movement between said needle and link may be secured, means for rotating said gear-wheel including a clutch and a stop carried by said needle for controlling said clutch, as and for the purpose set forth.

31. In a grain-binder, a needle pivotally mounted and provided with an extension beyond the point of pivotal support thereof, said extension arranged to project above the binder-deck to receive the incoming grain during the formation of the bundle, and thus serves as a tripping-arm, a link connected to said extension and a crank connection for actuating said link, as and for the purpose set forth.

32. In a grain-binder, a framework, a needle mounted to rock therein, a link connected to said needle for rocking the same, a crank for actuating said link, gearing for driving said crank, said gearing including a clutch, a stop carried by the needle and arranged to throw said clutch out of action, the needle adapted to be rocked by the pressure of the incoming grain to disengage said stop to throw said clutch into action, as and for the purpose set forth.

33. In a grain-binder, a needle provided with an extension arranged, when the needle is in its retracted position, to project above the binder-deck, gearing for actuating said needle, said gearing including a clutch, and a stop carried on the back of the needle for throwing said clutch into and out of action, as and for the purpose set forth.

34. In a grain-binder, the combination with a needle and packers arranged on opposite sides thereof, and means for actuating such packers, of gearing for actuating said needle, said gearing located between said packers

and within the arc described by the needle, as and for the purpose set forth.

35. In a grain-binder, a needle, packers arranged on opposite sides thereof, said needle provided with an extension beyond its point of pivotal support, a link connected to said extension, a gear-wheel located between said packers and within the arc described by the needle, said link having crank connection with said gear-wheel, as and for the purpose set forth.

36. In a grain-binder, a needle provided with an extension beyond its point of pivotal support, a link connected to said extension, a crank for actuating said link, said crank arranged within the arc described by the needle, and in close proximity to the point of pivotal support of the needle when the needle is in its retracted position, whereby a substantially right-angular relation is maintained between said link and needle extension during the compressing action of the needle, and the slowest movements of the needle are the final forward and its initial backward movement, as and for the purpose set forth.

37. In a grain-binder, a packer-shaft having the usual pair of packer-cranks, and packers actuated thereby, in combination with a clutch and gear for actuating the parts concerned in the operation of binding, and a needle, said clutch, gear and needle located between said packer-cranks, as and for the purpose set forth.

38. In a grain-binder having cord holding and knotting devices, a needle adapted to carry the twine around the gavel and deliver it to the cord holding and knotting devices, a packer-shaft having a crank arranged on each side of the plane in which the needle operates, packers actuated by said cranks, and a clutch-and-gear mechanism for actuating the cord holding and knotting devices, said clutch-and-gear mechanism arranged between the planes of movement of said packers, as and for the purpose set forth.

39. In a grain-binder, a packer-shaft having a pair of cranks, packers actuated by said cranks, and a needle arranged to operate in a plane between the planes of movement of said packers, in combination with a clutch mechanism including a pinion and a dog, said pinion mounted on said packer-shaft between said packers and a stop on said needle and arranged to disengage said clutch, as and for the purpose set forth.

40. In a grain-binder, cord holding and knotting devices, a needle having a substantially concentric portion serving as a cut-off for the grain, a packer-shaft having its axis arranged within said concentric portion, said shaft having a crank on each side of said needle, packers arranged to be actuated by said cranks, a pinion for actuating those parts concerned in the operation of binding, drivers on said packer-shaft, and a clutch adapted to connect said pinion to said drivers, all combined substantially as described, whereby the needle, when in its normally-retracted position, lies over said clutch and prevents straws from falling through the slot in the binder-deck and when advanced to its work carries away any straws accumulated thereover, as and for the purpose set forth.

In witness whereof I have hereunto set my hand this 25th day of May, 1895.

PAUL HANSON.

In presence of—
M. I. CAVANAGH,
S. E. DARBY.