

E. W. JENKINS.
 GRAIN BINDER.
 APPLICATION FILED DEC. 29, 1913.

1,174,159.

Patented Mar. 7, 1916.

3 SHEETS—SHEET 1.

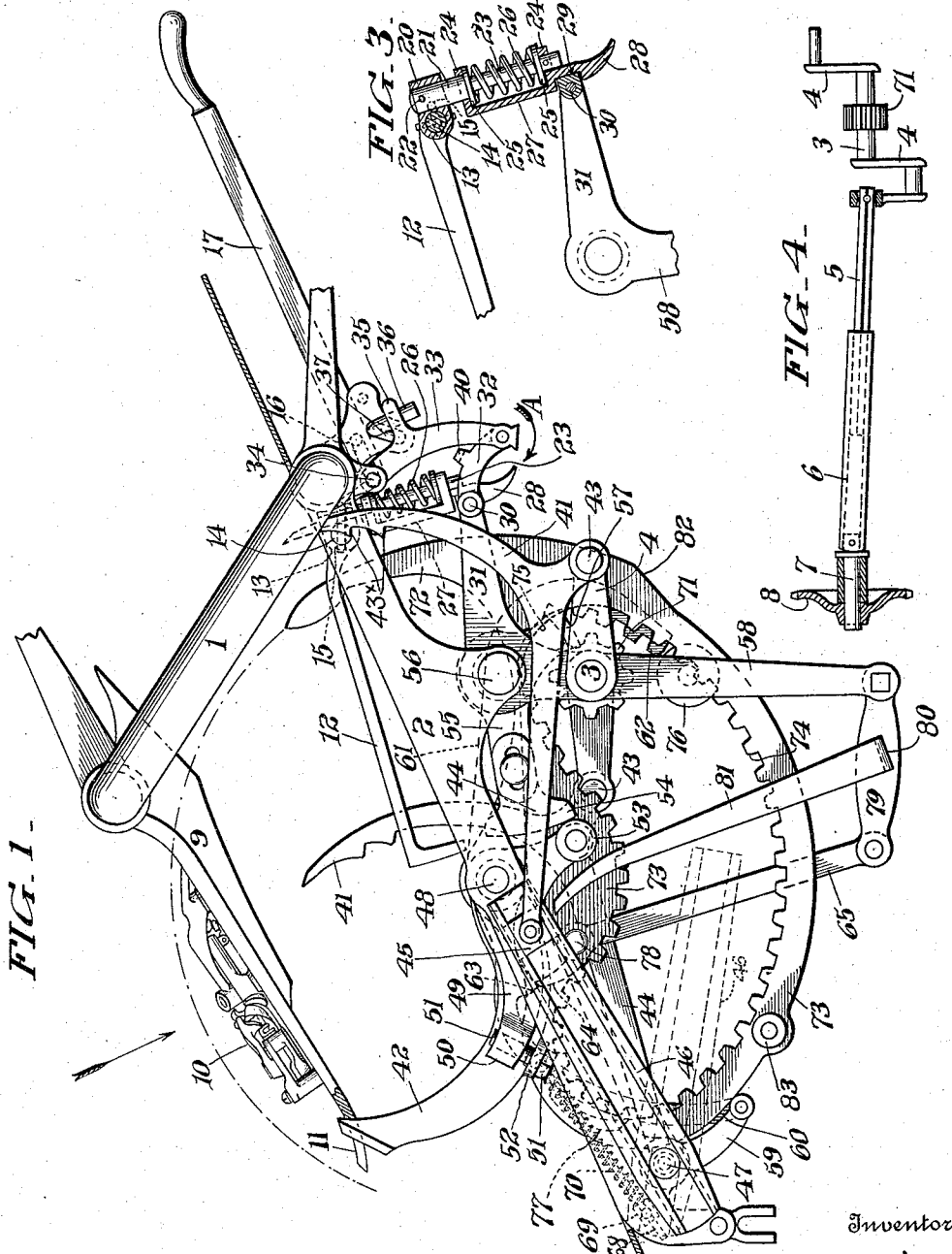


FIG. 1.

FIG. 2.

FIG. 4.

Witnesses
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 C. H. Wisemann

Inventor
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By 
 Attorney

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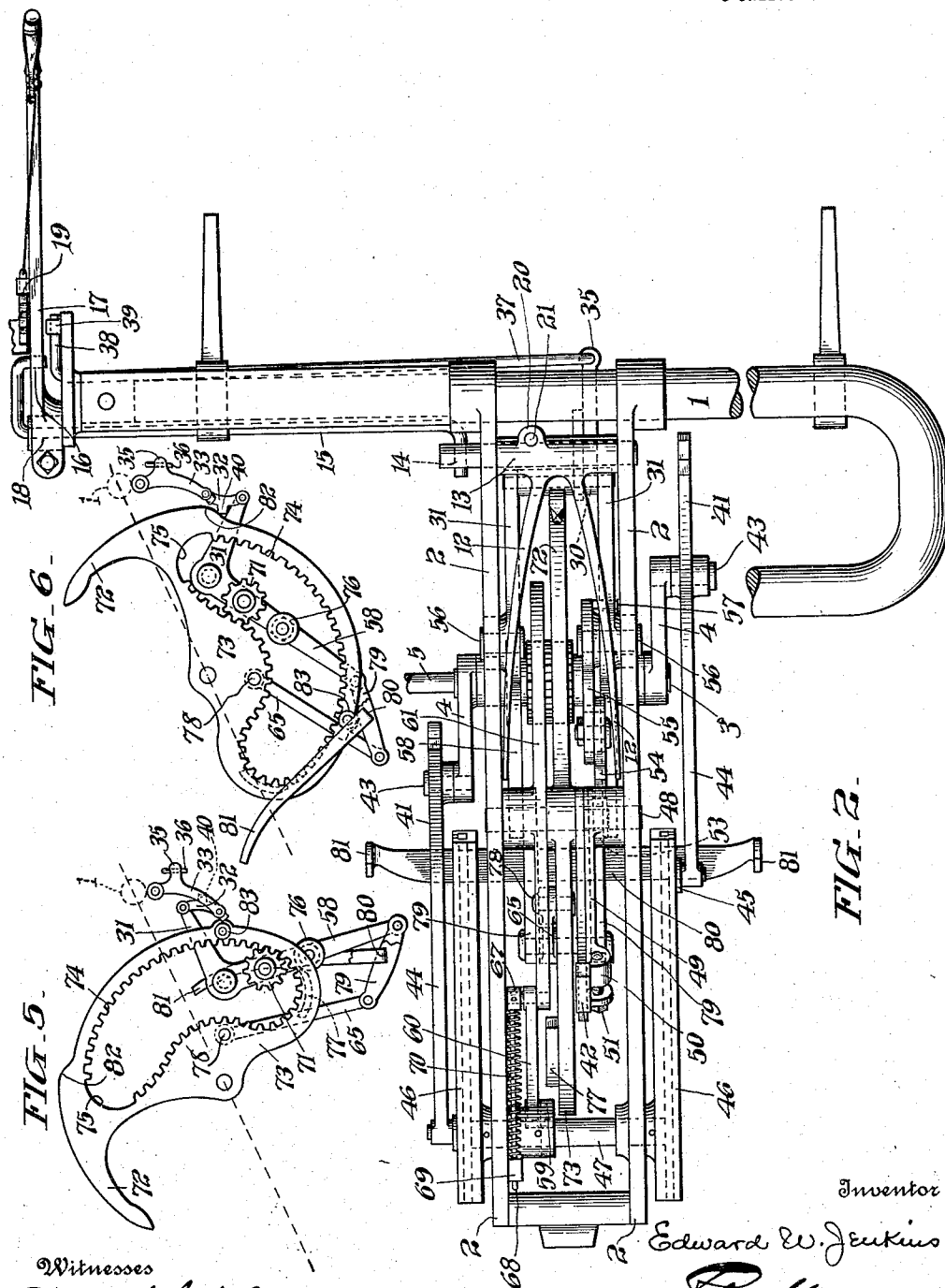


FIG. 1.

FIG. 2.

FIG. 3.

FIG. 4.

FIG. 5.

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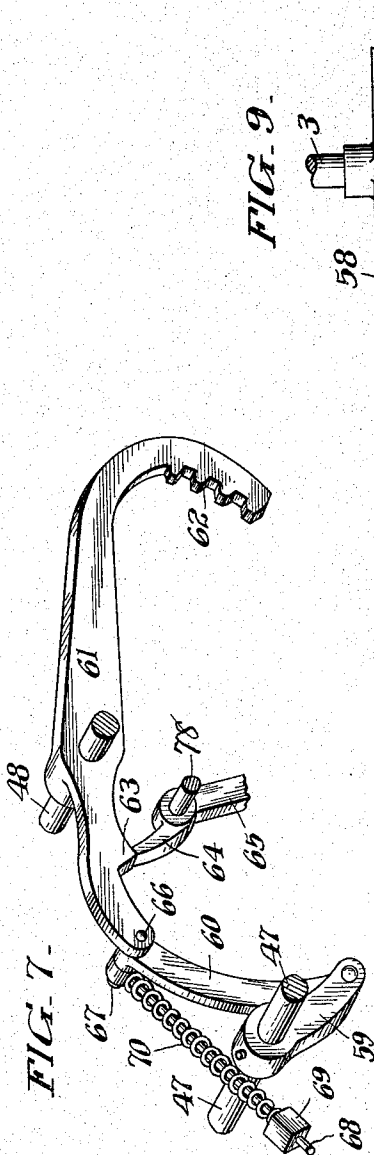


FIG. 9.

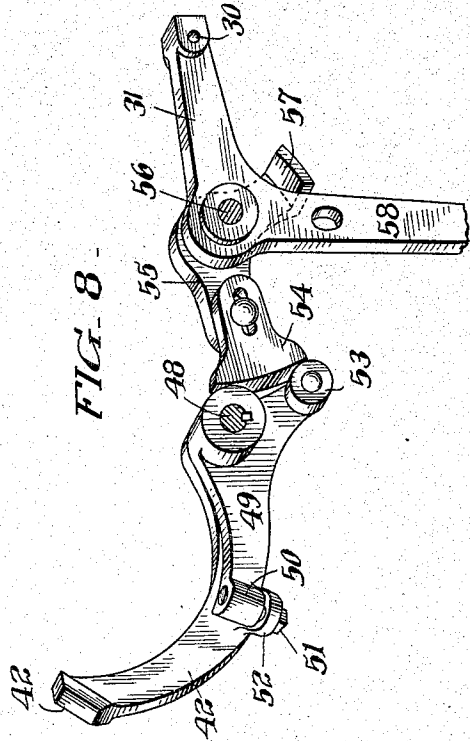
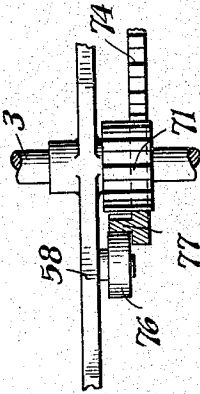


FIG. 8.

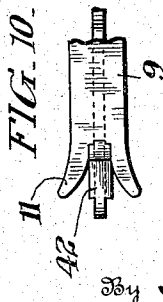


FIG. 10.

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UNITED STATES PATENT OFFICE.

EDWARD W. JENKINS, OF NORRISTOWN, PENNSYLVANIA.

GRAIN-BINDER.

1,174,159.

Specification of Letters Patent.

Patented Mar. 7, 1916.

Application filed December 29, 1913. Serial No. 809,213.

To all whom it may concern:

Be it known that I, EDWARD W. JENKINS, citizen of the United States, and resident of Norristown, county of Montgomery, and State of Pennsylvania, have invented an Improvement in Grain-Binders, of which the following is a specification.

The object of my invention is to provide an organized apparatus for satisfactorily packing and binding grain into a bundle, and the present improvements are more particularly directed, among other features, to the means for insuring the proper density of the bundle at the time of binding the same with the cord, and for insuring the act of binding and the tying of a knot automatically under the control of pressure of the grain which is being packed to constitute the bundle.

My object is also to provide a cradle arm against which the grain is packed by the packers in the formation of the bundle, the said cradle arm being adjustable in such manner that it may also act as a direct support for the knot-tying mechanism, so that the latter, together with its carrying means, is supported against the action of the needle arm during the process of tying the knot, whereby undue wear and looseness of the supporting parts of the knot-tier are prevented, and whatever wear should occur may be taken up by the adjustable means constituting in part the cradle arm; said cradle arm being so arranged as to directly receive the thrust of the overhanging knotter and its support and transfer it to the main part of the binder frame at a lower elevation.

My object is also to provide special improvements for operating the needle arm whereby it is positively reciprocated to bind the bundle and then brought to rest, the said movements being accomplished by a floating gear engaging a return rack upon the binder arm and positively maintained in geared relation thereto during the binding operation.

My object is further to provide means for operating the packers whereby they may be suitably thrown up into operating packing position, or down out of packing action at the proper times, the said actions being governed by the same means which operates and controls the time of action of the binder arm; and further, by the employment of discharging devices or kickers which are brought into action by the combined operation of the needle arm and the means employed for operat-

ing them during the act of binding the bundle.

My invention also has for its objects other features of improvements which will be understood from the description hereinafter contained.

My invention consists of the various constructions and combinations of elements which are hereinafter described in connection with the drawings for accomplishing the above specified objects, and which improvements are specifically defined in the claims.

Referring to the drawings, Figure 1 is a side elevation of a grain binding apparatus embodying my invention; Fig. 2 is a plan view of the same with the knot tier and its supporting frame broken away; Fig. 3 is a sectional elevation of a portion of the means for throwing the needle arm into action; Fig. 4 is an elevation with part in section of the floating gear and cranks, and operating mechanism for actuating the needle arm and its associated parts, and Figs. 5 and 6 are diagrammatic elevations illustrating the two extreme positions of the needle arm, its operating mechanism and the kickers for discharging the bundle; Fig. 7 represents a perspective of the rack arm and packer operating mechanism and certain of its adjuncts; Fig. 8 represents a perspective of the cradle arm and the locking mechanism therefor; Fig. 9 represents a detail of the mechanism for maintaining the driving pinion in engagement with the needle rack; Fig. 10 represents a detail showing the engaging relation of the cradle arm with the knotter frame.

1 designates a portion of the binder frame having secured thereto the extended side bars 2 which form supports for the deck as well as certain parts of the mechanism and are provided with journals as will later appear.

3 designates a crank shaft carrying at opposite ends the packer operating cranks 4. In the present instance the crank shaft 3 is driven by a spindle 5 mounted for sliding adjustment within the sleeve 6, which is pinned or otherwise fixed to the driving shaft 7 which carries the sprocket 8. The latter element is driven from any suitable source of power as will be understood.

By reference to Fig. 1 it will be seen that the frame 1 extends a suitable distance above the side bars 2 for the purpose of forming

a support for the breast plate or knotter frame 9 which carries the knot-tying mechanism 10. The free end of the knotter frame 9 terminates in a bifurcation 11 with which certain adjuncts of the binding and packing mechanism are adapted to cooperate, and the function of this part will be duly explained in connection with the later description.

12 designates a pair of trip arms formed integral with, or secured to a hub 13 and arranged in diverging relation from the said hub in order to extend a suitable distance in the direction of the side bars 2 to form a suitable support for receiving the grain as it is fed into the machine. The hub 13 is fixed to rotate with a stub shaft 14 having its ends journaled respectively in the side bars 2, and one of said ends projecting beyond the side bar and being transversely apertured to receive the end of a torsion spring 15 which is mounted upon the frame 1 and has its opposite end reversely bent to enter and normally seat within an opening 16 in a hand lever 17, which latter is pivoted at 18 to the frame 1. A suitable ratchet mechanism 19 is provided to maintain the lever 17 in fixed position and to afford a means for adjusting the tension of the spring 15. As this lever 17 extends conveniently near the machine driver or operator, it may be readily manipulated, while the machine is in motion, to vary the tension of the spring 15 to regulate the action of the trip, thereby enabling either large or small bundles to be bound at will.

The hub 13 is provided with an apertured lug 20 to receive the end of a plunger 21 which is pinned at 22 to the lug 20 and is provided with a stem 23 slidably mounted in ears 24 and carrying the followers 25 for the spring 26, the aforesaid construction forming a spring buffer or shock absorber to take up the jars and shocks of the parts of the mechanism transmitted in either direction. The member 27 which carries the ears 24 is provided with an extension 28 having a recess 29 therein which serves the purpose of a catch or lock for retaining the lever arms 31 in normal position, a function which will be hereinafter described. The arms 31 are suitably connected by a rod 30 so that both are controlled together.

32 designates a link pivoted to the rod 30 at one end and at its opposite end to an arm 33 which is pivoted at 34 to a suitable part of the frame 1. The said arm 33 is preferably provided with an eyelet 35 to receive the angularly disposed end 36 of a torsion spring 37 which is suitably secured to the frame 1 and has its opposite end 38 fixed in a lug 39 of the said frame 1. The spring 37 is normally under tension to move the arm 33 and link 32 in the direction of the arrow A so that when the catch mechanism 29 is released the parts controlled by the said

spring 37 will be automatically actuated to produce certain movements in the cycle of operation. In connection with the link 32 it will be noted that the same is provided with a lug 40 the function of which will later appear.

As the grain is received upon the trip arms 12 it is subjected to the action of the packers 41 which feed it into position against the cradle arm 42 so that the proper size bundle is automatically made up for the binding and tying operations. The packers 41 are pivoted respectively at 43 to the cranks 4 and each is provided with suitable spurs or projections 43^x and with an extension 44 carrying a cross head 45 which head slides in the pivoted guide bars 46, the latter members being fixed to the rock shaft 47 which in turn is journaled in the side bars 2. The spurs or projections of the packers serve to impart an extra pressure upon the grain to assist in the actuation of the trip mechanism of the arms 12, thus insuring the operation of the binding mechanism when the proper quantity of grain has been formed into a bundle.

The cradle arm 42 is movably mounted upon a pin 48 having a bell crank member 49 keyed thereto, one end of which terminates in a threaded head 50 for receiving the bolt 51. This bolt 51 passes through an apertured ear 52 upon the cradle arm 42, thus affording a means for adjusting and varying the relation of the cradle arm to the bifurcated end of the breast plate 9 with which latter the cradle arm is adapted to engage during the packing and knot-tying operations in order to steady the free end of the breast plate, take up the thrust of the parts and prevent undue wear. The opposite end of the bell crank 49 carries a roller 53 adapted to contact with the adjustably mounted cam plate 54, which is carried by the lever 55 upon the pivot pin 56 of one of the lever arms 31.

57 designates a trip member positioned between the arms 31 and 58 of one of the operating levers and preferably forms an integral part of the lever 55. Thus when the short arm 31 moves into contact with the trip 57 it will cause the lever 55 to rock, thus shifting the cam plate 54 so that the roller 53 is no longer fixed and consequently the cradle arm 42 is free to swing by gravity away from the breast plate 9 to permit the bundle to be removed or ejected from the machine.

At the conclusion of the packing operation it is essential that the packers be shifted to allow the needle arm to carry the binding cord around the grain and to the knot tying mechanism, and for this purpose I have provided a mechanism for shifting the packer guide arms 46 from their normal operative position to that shown in dotted

lines in Fig. 1. The mechanism for accomplishing this end consists in the present instance of a crank arm 59 suitably fixed to the rock shaft 47 and pivotally connected through a link 60 to a rack arm 61 having a suitable rack 62 formed thereon. The arm 61 is mounted for swinging movement upon the pin 48 and is provided with a locking shoulder 63 which is adapted to be engaged by a finger 64 of the connecting rod 65. The pivot 66 which connects the link 60 and rack arm 61 carries the apertured head 67 of a stem 68 which is slidingly mounted in a fixed abutment or block 69 of the side bar 2, and between the said block and head 67 there is a compression spring 70 which acts to break the toggle-like connection of the parts 60 and 61 at certain times to cause the packer guides to shift quickly to the position where the packers are inoperative. The rack 62 is operated in the present instance by means of a pinion 71 keyed to the crank shaft 3 and movable with the lever arm 58, it being understood that the said pinion and rack are normally out of mesh but are thrown into engagement by the automatic releasing of the lever arm 31.

72 designates the needle arm which is preferably formed integral with a rack disk 73 swingingly mounted upon the spindle 48, the said disk being suitably cut away to form an internal cam shaped rack 74 which is continuous except for a small portion of its length as shown at 75, this part being between the beginning and end of the needle arm stroke. It will therefore be apparent, owing to the fact that the pinion is rotating in substantially fixed relation to its adjuncts, that as soon as it comes into mesh with the rack 74, it will cause the needle arm disk 73 to swing about its pivot 48 and thus cause proper oscillation of the needle arm 72. In order to prevent the disk 73 dropping away from the pinion 71, at the end of the up-stroke of the needle arm, I have provided a cam roller 76 carried by the lever 58 and so positioned as to contact with the bottom portion of a cam 77 fixed to the disk 73 adjacent the part thereof corresponding to the end of the up-stroke of the needle arm 72, as will be understood. The pinion is thus effectually maintained in mesh with the rack 74 throughout its length and imparts a proper oscillating movement thereto to give the needle arm a movement timed with its adjuncts. This movement of the rack disk 73 I have utilized as a means for transmitting movement to the kicking mechanism for ejecting the bundle of grain from the machine after the knotting operation, and the mechanism for carrying out this step comprises the connecting rod 65 which is pivoted at 78 to a suitable part of the said disk and has its opposite end connected by a link 79 to the lever arm 58 and through this

link 79 I have passed the transverse bar 80 which carries the upwardly extending kicker members 81 which terminate adjacent the grain bundle in its cradle.

82 designates a cam abutment formed on the outer face of the needle arm in order to contact with the lug 40 at a certain time in the travel of the needle arm, and 83 designates a roller carried by the disk 73 for the purpose of engaging the arm 33 for a purpose which will be later described.

The operation of the device is as follows: With the parts positioned as shown in Fig. 1, and with the crank shaft rotating, the mechanism is ready to receive the grain for binding purposes and the several steps in the operation take place as follows: The grain is automatically fed to the machine and is received upon the arms 12 which are normally held above the deck, where the grain is in position to be carried forward and packed against the arm 42 by the action of the packers 41 which are continually operating adjacent the arms 12. When a bundle of grain of sufficient size has been placed in position, the pressure thereof is sufficient to depress the trip arms 12 against the action of the spring 15 with the result that the latch member 28 is thrown to the right as shown in Fig. 3, thus releasing the lever 31 and its adjuncts. The moment this lever is free to move, the spring 37 through the arm 33 and link 32 causes the lever 31 to turn sufficiently upon its pivot to bring the rotating pinion 71 into mesh with the segment rack 62, which latter it will be noted is normally located substantially the depth of a tooth nearer to the pinion than the internal rack 74, and is therefore actuated prior to any movement of the needle arm and its parts. As soon as the pinion meshes with the rack 62 movement is transmitted to the latter and it swings upon its pivot 48 until a position is reached where the action of the spring 70 is sufficient to give a quick downward throw to the link 60 and thus rock the shaft 47 to bring the packer guides 46 to the position indicated in dotted lines in Fig. 1, which action removes the packers from the field of the bundle. Attention is directed to the fact that when the lever arm 31 is shifted as above described the long arm 58 of the same lever is of course moved correspondingly, thereby swinging the connecting rod 65 so that the locking finger 64 is removed from the path of the rack lever 61. As the pinion 71 runs out of mesh with the rack 62 the spring 15 again shifts the lever arm 31 so that the pinion 71 now engages the rack 74 of the needle arm, thereby starting the needle on its forward, upward stroke. This movement of the needle is a continuous one, and the pinion 71 rides one side of the rack, then as the roller 76 engages the cam 77, the said pinion passes

across the bottom of the rack meeting the opposite side of the rack 74 and reversing the action of the needle, which then returns to its normal inoperative position as the knot-tying operation has now been completed, it of course being understood that the knot-tying mechanism is automatically actuated to tie the knot at the proper time in the cycle of operation. At the time the needle arm is approximately at the end of its up-stroke, the roller 83 comes into position to be engaged by the end of the spring pressed arm 33, which is the position shown in Fig. 5. In this position of the parts the pivotal points of the arm 33 are in the direct line of the applied force so that there is no chance for the said arm to turn upon the pivot 34 under the action of the movement of the lever 31, due to the movement of the pinion from one side of the rack to the other, and therefore the link 32 swings downwardly and assumes the position shown in Fig. 6. In this position the lug 40 projects into the path of movement of the cam surface 82 and consequently as the needle makes its return stroke its cam 82 forces the link 32 and arm 33 to the right as shown in Fig. 6 until such time as the pivotal point between the link 32 and lever arm 31 is above the end pivot of the arm 33. When this takes place the spring action causes the link 32 and connected lever 31 to snap back to the normal position shown in Fig. 1 and there be automatically locked by the action of the spring pressed cap 28. During the movement of the lever arm 31 to the position shown in Fig. 6, it is adapted to strike or contact with the trip 57, thereby moving the cam member 54 upwardly as shown in Fig. 8 and releasing the cradle arm 42 so that it may drop by gravity away from the breast plate 9 and thus permit the bound bundle to be ejected from the machine by the automatically actuated ejector arms or kickers 81. The rack arm 61 which has been instrumental in shifting the packers out of operative position is returned to its normal position by the action of the finger 64 which has, during the movement of the rack plate 73, been shifted again beneath the lug 63 so that as the said plate returns to its normal position it causes the rack arm 61 to be tilted back to its former position ready for engagement with the pinion 71 upon the next binding operation.

It will now be apparent that I have devised a complete unitary structure wherein the packing and binding of grain into a bundle are carried out in a satisfactory and efficient manner producing a bundle of proper density and one which is securely held by the knotted binding cord. It will further be apparent that I have provided in the cradle arm structure a means which is adapted to coact with the breast plate

of the knot-tying mechanism so that the latter as well as other adjuncts of the binding mechanism are relieved of the thrust and strains caused by the oscillation of the needle arm and results in a material reduction of the wear of the moving parts. Furthermore, it will be noted in this connection that the aforesaid cradle arm may be readily adjusted to take up any wear which may occur and thus always be maintained at certain times in bracing engagement with the breast plate. This adjustment is effected through the medium of either the adjusting bolt 51 or the adjustably mounted cam locking member 54. It will further be apparent that I have provided in the floating pinion and its encircling needle arm rack a positive means for controlling the actuation of the needle arm for either stroke thereof and thus insuring the correct timing of the needle arm with respect to the mechanism which is dependent upon the said needle arm for binding and tying the knot in the binding cord. It will further be apparent that I have devised an exceedingly effective packing mechanism which is controlled by an automatic mechanism serving to vary the position of the packers according to the particular operation in action and the said packers are therefore automatically moved first to a position to pack the grain into a suitable bundle and then automatically thrown to a position where they become inoperative as far as the grain is concerned, and removed from the vicinity of the needle arm and the knot tying mechanism during the binding and tying of the grain.

It will now be apparent that I have devised a novel and useful construction which embodies the features of advantage enumerated as desirable in the statement of the invention and the above description, and while I have in the present instance shown and described the preferred embodiment thereof which has been found in practice to give satisfactory and reliable results, it is to be understood that the same is susceptible of modification in various particulars without departing from the spirit or scope of the invention or sacrificing any of its advantages.

Having thus described my invention, what I claim and desire to secure by Letters Patent of the United States is:—

1. In a grain binder, a pivoted needle arm and means to impart a rotary reciprocating motion thereto, in combination with a trip upon which the grain is supported, trip devices for controlling the means for operating the said needle arm when the proper size bundle is packed, and a plurality of packers for packing the grain in bundle form upon said trip, said packers movable transversely to the trip and each having spurs or projections on the edge which pack the grain and the spurs arranged to catch

upon the grain forming the bundle and pull it upon the trip to assist in the positive actuation of the trip devices.

2. In a grain binder, a pivoted needle arm and means to impart a rotary reciprocating movement thereto, in combination with a trip upon which the grain is fed, said trip being mounted to yield under the pressure of the grain, latch means operable by the movement of said trip for controlling the time of operation of the needle arm actuating means, and a plurality of packers for packing the grain in bundle form upon said trip, said packers movable transversely to the trip and each having one or more spurs or projections upon the edge which pack the grain, said spurs or projections arranged to catch upon the grain and pull it down upon the trip to insure the positive operation of the trip to release the latch means when a bundle of proper size and density has been packed.

3. In a grain binder the combination of a deck upon which the grain is supported, a rotary reciprocable needle arm, power devices for reciprocating said needle arm, a breast plate, a pivoted cradle arm extending upward from the deck and normally having its free end extended to engage the end of said breast plate, means to vary the relation between said breast plate and said cradle arm, means for rocking said cradle arm, intermittently actuated means for controlling the operation of said needle arm, packing devices for packing the grain against the cradle arm, and a trip mechanism for automatically controlling the needle arm actuating means whereby the bundle will be bound when fully packed.

4. In a grain binder the combination of a rotary reciprocable needle arm, a deck or table upon which the grain is packed and bound, a breast plate, a pivoted cradle arm having its free end extended to normally engage the end of said breast plate, a member fixedly mounted on the pivot of said cradle arm, means between said cradle arm and said member for adjusting said cradle arm relative to said member, power devices for automatically shifting said cradle arm into and out of engagement with the breast plate, packers for packing the grain against said cradle arm, power devices for operating said needle arm and said packers, and a trip mechanism actuated by the pressure of the packed grain for controlling the time of operation of said needle arm.

5. In a grain binder the combination of a rotary reciprocable needle arm, a deck or table upon which the grain is packed and bound, a breast plate, a pivoted cradle arm adapted to engage the free end of said breast plate, a member fixedly mounted on the pivot of said cradle arm, means between said cradle arm and said member for ad-

justing said cradle arm relative to said member, means for locking said cradle arm in engagement with said breast plate for a predetermined length of time, power devices for automatically shifting said cradle arm into and out of operative position, packers for packing the grain against said cradle arm, power devices for operating said needle arm and said packers, and a trip mechanism actuated by the pressure of the packed grain for controlling the time of operation of said needle arm.

6. In a grain binder the combination of a rotary reciprocable needle arm, a deck or table upon which the grain is packed and bound, a breast plate for the knotter, a pivoted cradle arm adapted to engage the free end of said breast plate, a member fixedly mounted on the pivot of said cradle arm, means between said cradle arm and said member for adjusting said cradle arm relative to said member, means for locking said cradle arm in engagement with said breast plate for a predetermined length of time, power devices for automatically shifting said cradle arm into and out of operative position, packers for packing the grain against said cradle arm, power devices for operating said needle arm and said packers, a trip mechanism actuated by the pressure of the packed grain for controlling the time of operation of said needle arm, and means for automatically releasing said locking means at the proper time.

7. In a grain binder a rotary reciprocable needle arm, a cam shaped rack formed in a part of said needle arm, a pinion adapted to mesh with said rack for causing a reciprocating motion to be imparted to said needle arm, a shaft for said pinion, a pivoted arm having a journal for said shaft and connecting means between said needle arm and said pivoted arm for oscillating said pivoted arm simultaneously with the operation of said needle arm, whereby said pinion is maintained in mesh with said rack throughout the length of said rack.

8. In a grain binder a rotary reciprocable needle arm, a pair of substantially concentric racks formed in a part thereof, said racks being connected at one end by a series of teeth forming a continuation of each rack, a pinion arranged to mesh with both of said racks for imparting a rotary reciprocating motion to said needle arm, a shaft for said pinion, a pivoted arm in which said shaft is journaled, and connecting means between said needle arm and said pivoted arm for oscillating said pivoted arm at a predetermined time in the operation of said needle arm, whereby said pinion is maintained in mesh with said rack and moves from one rack to the other at the proper time.

9. In a grain binder a rotary reciprocable needle arm, a pair of substantially concen-

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tric racks formed in a part thereof, said racks being connected at one end by a series of teeth forming a continuation of each rack, a pinion arranged to mesh with both of said racks for imparting a rotary reciprocating motion to said needle arm, a shaft for said pinion, a pivoted arm in which said shaft is journaled, connecting means between said needle arm and said pivoted arm for oscillating said pivoted arm at a predetermined time in the operation of said needle arm, whereby said pinion is maintained in mesh with said rack and moves from one to the other at the proper time, and means for maintaining said pinion in mesh with the connecting teeth between the racks.

10. In a grain binder, a rotary reciprocable needle arm, a pair of substantially concentric racks formed in a part thereof, said racks being connected at one end by a series of teeth forming a continuation of each rack, a pinion arranged to mesh with both of said racks for imparting a rotary reciprocating motion to said needle arm, a shaft for said pinion, a pivoted arm in which said shaft is journaled, means to lock said pivoted arm against movement at certain times and a trip mechanism automatically actuated for controlling the operation of said locking means.

11. In a grain binder the combination of a deck upon which the grain is supported, a rotary reciprocable needle arm, power devices for reciprocating said needle arm, a pivoted cradle arm, a plurality of packers pivotally mounted adjacent to said deck for suitable movement to pack the grain against said cradle arm, and means independent of the needle arm and its operative mechanism for automatically shifting said packers to inoperative position at a predetermined time before the movement of the needle arm.

12. In a grain binder the combination of a deck upon which the grain is supported, a rotary reciprocable needle arm, power devices for reciprocating said needle arm, a pivoted cradle arm, a plurality of packers pivotally mounted adjacent to said deck for suitable movement to pack the grain against said cradle arm, a sliding guide means for one end of each of the packers, and means to move said guide to a different angle at a predetermined time to cause the packers to assume a position removed from the grain on said deck.

13. In a grain binder the combination of a deck upon which the grain is supported, a rotary reciprocable needle arm, power devices for reciprocating said needle arm, a pivoted cradle arm, a plurality of packers mounted adjacent to the deck for suitable movement to pack the grain against said cradle arm, a separate sliding guide means for one end of each of the packers, and means controlled by the actuation of said power devices for shifting said guides to a

different angle at a predetermined time to cause the packers to assume a position removed from the grain on said deck.

14. In a grain binder, the combination of a deck upon which the grain is supported, a rotary reciprocable needle arm, power devices for reciprocating said needle arm, a pivoted cradle arm, a plurality of packers mounted for suitable movement adjacent said deck to pack the grain against said cradle arm, a guide for one end of each of the packers, a rack lever pivoted adjacent said guides, a pivoted arm, a pinion carried by said arm and adapted to mesh with said rack lever to transmit movement thereto at certain times, means operated by said pinion for imparting a rotary reciprocatory motion to said needle arm, and a spring operated connection between said rack lever and said packer guides for shifting said guides at a predetermined time to cause the packers to assume a position removed from the grain on said deck.

15. In a grain binder, the combination of a deck upon which the grain is supported, a rotary reciprocable needle arm, power devices for reciprocating said needle arm, a pivoted cradle arm, a plurality of packers mounted for suitable movement adjacent said deck to pack the grain against said cradle arm, a guide for one end of each of the packers, a rack lever pivoted adjacent said guides, a pivoted arm, a pinion carried by said arm and adapted to mesh with said rack lever to transmit movement thereto at certain times, means operated by said pinion for imparting a rotary reciprocatory motion to said needle arm, a spring operated connection between said rack lever and said packer guides for shifting said guides at a predetermined time to cause the packers to assume a position removed from the grain on said deck, and means to lock said rack lever at the time said packers are in operative engagement with the grain.

16. In a grain binder, the combination of a deck upon which the grain is supported, a rotary reciprocable needle arm, power devices for reciprocating said needle arm, a pivoted cradle arm, a plurality of packers mounted for suitable movement adjacent said deck to pack the grain against said cradle arm, a guide for one end of each of the packers, a rack lever pivoted adjacent said guides, a pivoted arm, a pinion carried by said arm and adapted to mesh with said rack lever to transmit movement thereto at certain times, means operated by said pinion for imparting a rotary reciprocatory motion to said needle arm, a spring operated connection between said rack lever and said packer guides for shifting said guides at a predetermined time to cause the packers to assume a position removed from the grain on said deck, means to lock said rack lever

at the time said packers are in operative engagement with the grain, and means for automatically releasing said locking means at a predetermined time.

5 17. In a grain binder the combination of a breast plate for the knotter, a cradle arm pivotally mounted adjacent thereto and normally engaging the free end of said breast plate, a lever pivoted in close proximity to
10 said cradle arm, a locking member adjustably carried by said lever for contacting with said cradle arm and holding said cradle arm in fixed relation to said breast plate, a trip member carried by said lever, and means
15 for automatically operating said trip member to release said locking member at a predetermined time.

18. In a grain binder a rotary reciprocable needle arm, a cam shaped rack formed
20 in a part of said needle arm, a pinion adapted to mesh with said rack for causing a reciprocating motion to be imparted to said needle arm, a shaft for said pinion, a pivoted arm having a journal for said shaft, a pivoted
25 cradle arm, means operated by the movement of said pivoted arm for moving said pivoted cradle arm to inoperative position, a plurality of kickers or ejectors, and means operated by the movement of said rack for
30 actuating said kickers when said cradle arm is in inoperative position.

19. In a grain binder a pivoted needle arm and means to impart a rotary reciprocating movement thereto, in combination with a
35 trip upon which the grain is fed, said trip being mounted to yield under the pressure of the grain, spring controlled means for holding said trip in normal position until the proper sized bundle has been packed, a
40 pivoted arm for controlling the actuation of said needle arm operating means, means connected to said pivoted arm having a normal tendency to shift said arm to throw said
45 needle arm means into operation, a latch member for holding said pivoted arm in fixed inoperative position, and means actuated by the movement of said trip for releasing said latch at a predetermined time.

20. In a grain binder a pivoted needle
50 arm and means to impart a rotary reciprocating movement thereto, in combination with a trip upon which the grain is fed, said trip being mounted to yield under the pressure of the grain, spring controlled means
55 for holding said trip in normal position until the proper sized bundle has been packed, a pivoted arm for controlling the actuation of said needle arm operating means, a toggle mechanism connected to said
60 pivoted arm, a spring connected to said toggle mechanism having a tendency to normally move said toggle mechanism to throw said pivoted arm to operative position, and a trip controlled latch for locking said pivoted
65 arm in inoperative position.

21. In a grain binder a pivoted needle arm and means to impart a rotary reciprocating movement thereto, in combination with a trip upon which the grain is fed, said
70 trip being mounted to yield under the pressure of the grain, spring controlled means for holding said trip in normal position until the proper sized bundle has been packed, a pivoted arm for controlling the actuation of said needle arm operating means, a toggle
75 mechanism connected to said pivoted arm, a spring connected to said toggle mechanism having a tendency to normally move said toggle mechanism to throw said pivoted arm to operative position, a trip controlled latch
80 for locking said pivoted arm in inoperative position, and means to automatically release said trip mechanism at a predetermined time.

22. In a grain binder, a pivoted needle
85 arm, gearing to operate the needle arm intermittently, a carrier for the gear for putting it into and out of operation, a trip upon which the grain is supported mounted to yield under the pressure of the grain,
90 a latch means operated by the movement of the trip for engaging the carrier for the gear to normally hold it out of engagement with the needle arm until the bundle is packed, a shock absorber arranged in con-
95 nection with the latch for taking up the thrust of the carrier for the gear when thrown out of operation, and a plurality of packers for packing the grain in bundle form upon the trip.

23. In a grain binder, a pivoted needle
100 arm, gearing to operate the needle arm intermittently, a carrier for the gear for putting it into and out of operation, a trip upon which the grain is supported mounted to
105 yield under the pressure of the grain, a latch means operated by the movement of the trip for engaging the carrier for the gear to normally hold it out of engagement with the needle arm until the bundle is
110 packed, a shock absorber arranged in connection with the latch for taking up the thrust of the carrier for the gear when thrown out of operation, a pivoted cradle arm for holding the grain while being
115 packed above the trip, means controlled by the carrier for the gear to hold the cradle arm in position while the grain is being packed, and while said carrier is held by the latch, and a plurality of packers for
120 packing the grain in bundle form upon the trip.

24. In a grain binder means for regulating the size of the bundles, consisting of the
125 binder arm, and the cradle arm in combination with means to lock the cradle arm in position, packers to pack the grain against the cradle arm, trip fingers extending in a position to receive the pressure of the grain acted upon by the packers, a spring to hold
130

the trip fingers against the pressure of the bundle, means actuated by said trip fingers independently of the action of the cradle arm to hold the binder arm out of action except
 5 when the trip fingers are moved, means to release the cradle arm by the action of the trip fingers and a controlling lever extending in reach of the driver, arranged to vary the tension of the spring to regulate the action of
 10 the trip, whereby large or small bundles may be bound at the will of the driver while the machine is in motion.

25. In a grain binder, a main frame for the binder, an arm to convey twine to the
 15 knotter, pivoted to said frame, a segmental rack formed in said arm, a pinion supported by said main frame, arranged to engage and disengage with said rack to work the arm, and means to operate said pinion in combi-
 20 nation with means to hold said pinion in mesh with the rack.

26. In a grain binder, the combination of a main frame for the binder, a knotter, a
 25 binder arm to convey twine to the knotter pivoted to said main frame and provided with a segmental rack, a pinion, and supporting means arranged to cause the pinion to engage and disengage with said racks to work the arm, and a rotating tumbling
 30 shaft for operating said pinion.

27. In a grain binder, the combination of a main frame for the binder, a knotter, a binder arm to convey twine to the knotter and having a segmental rack formed there-
 on, a swinging frame pivoted to said main 35 frame, a pinion journaled to said swinging frame in a position to engage with the rack, kickers or discharge arms pivoted to the swinging frame, and means in connection with said binder arm to work the kickers to
 40 discharge the bundle from the binder.

28. In a grain binder, the combination of a binder frame, a cradle arm pivoted to said frame and normally engaging the knotter supporting portion of said binder frame to 45 sustain it against end movement, means for moving said cradle arm from inoperative to operative position to close the rear of the binder and engage the knotter supporting portion when binding the bundle, and means 50 to adjust said cradle arm to compensate for wear of the operative parts supporting the knotter.

In testimony of which invention, I hereunto set my hand.

EDWARD W. JENKINS.

Witnesses:

MIRIAM M. DYSON,
 LEILA JENKINS.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."