No. 654,833. Patented July 31, 1900.

E. W. JENKINS.

GRAIN BINDER.

(Application filed July 20, 1898.)

(No Model.) 2 Sheets—Sheet 1.

FIG. 1.

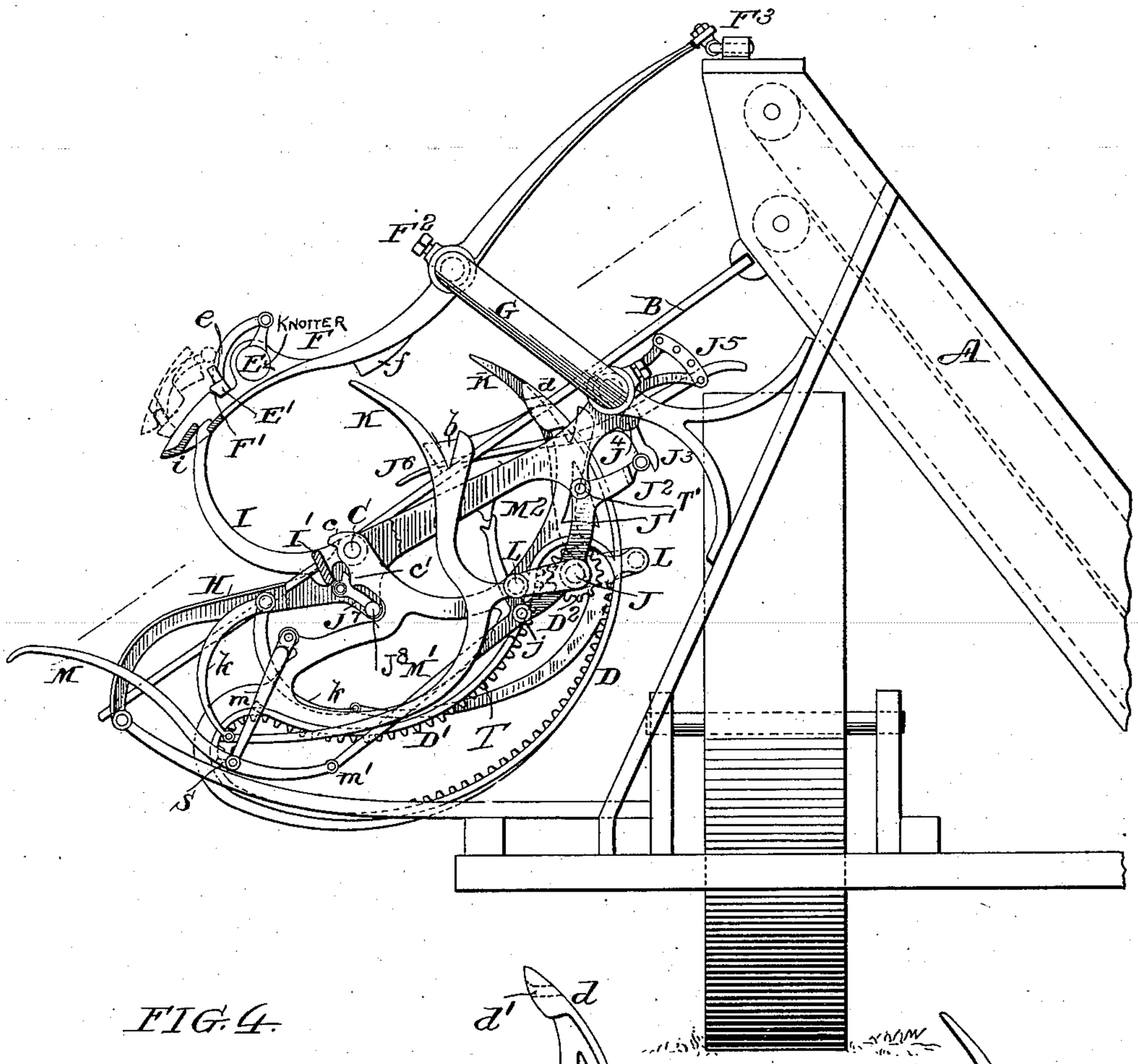


FIG. 4.

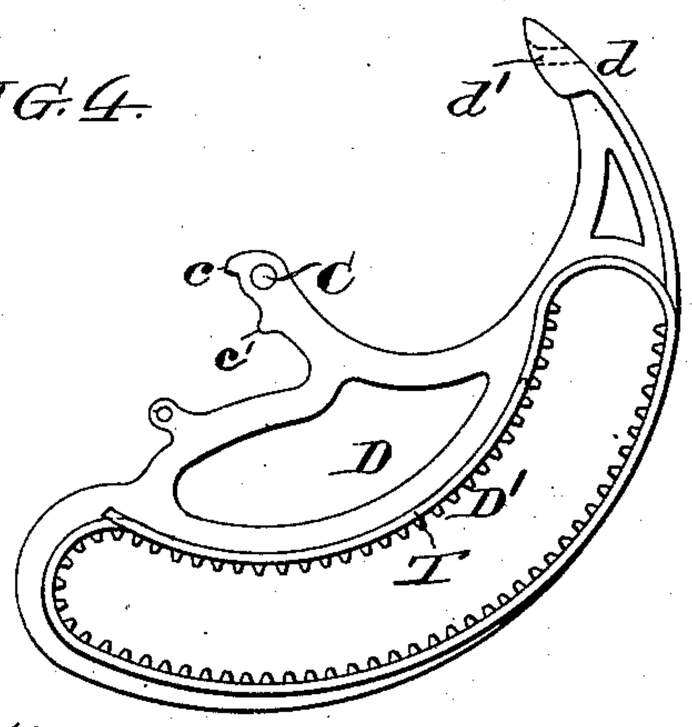
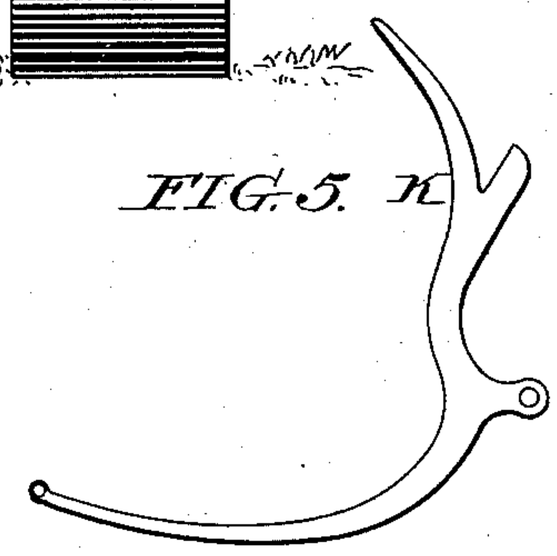


FIG. 5.



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(No Model.) 2 Sheets—Sheet 2.

FIG. 3.

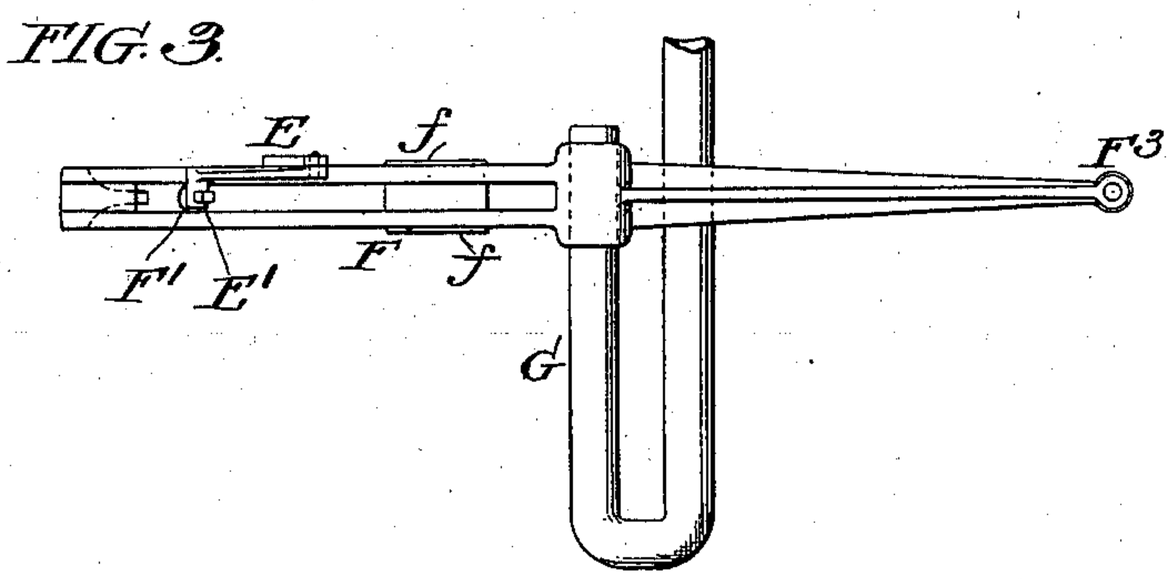


FIG. 2.

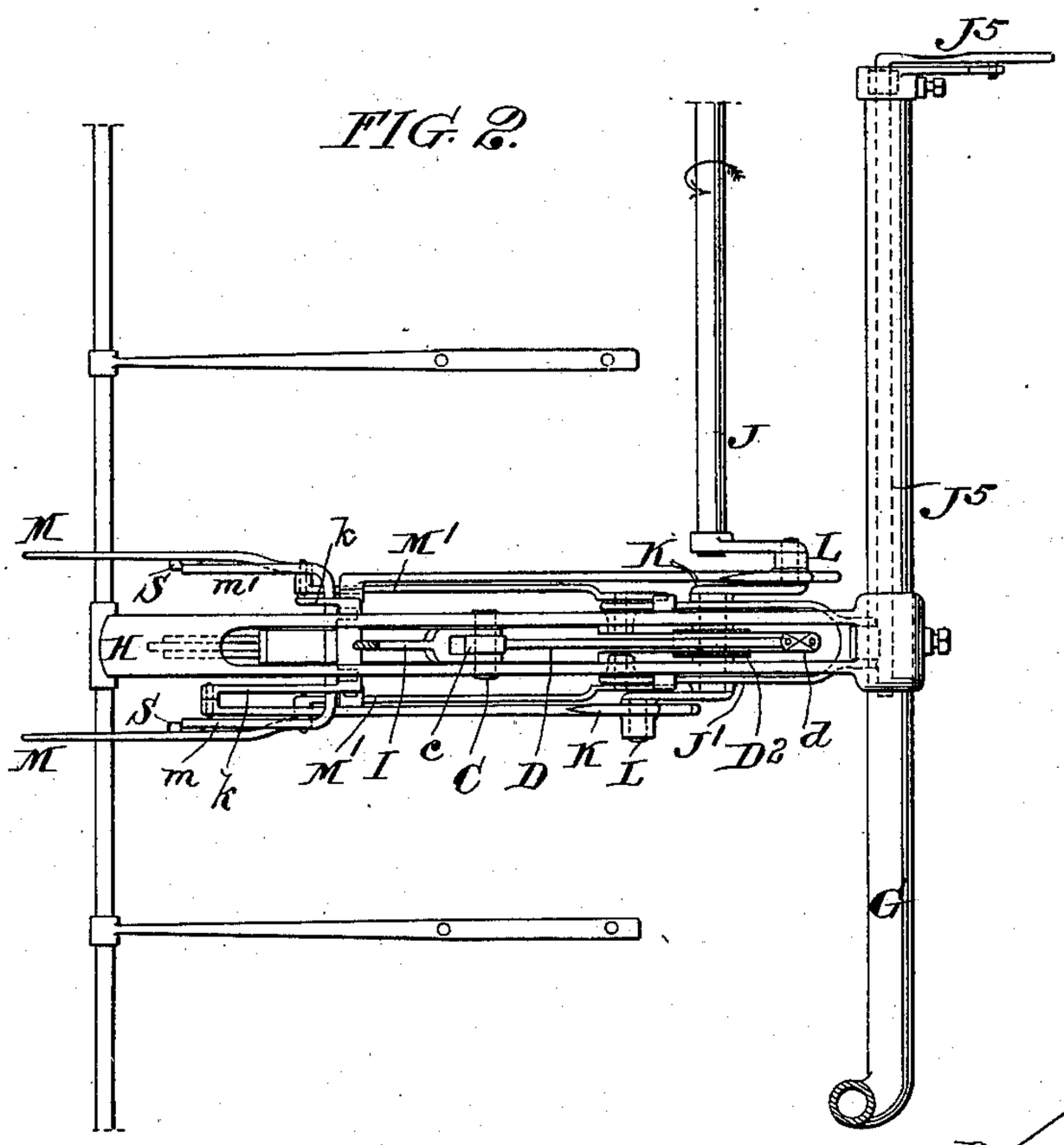
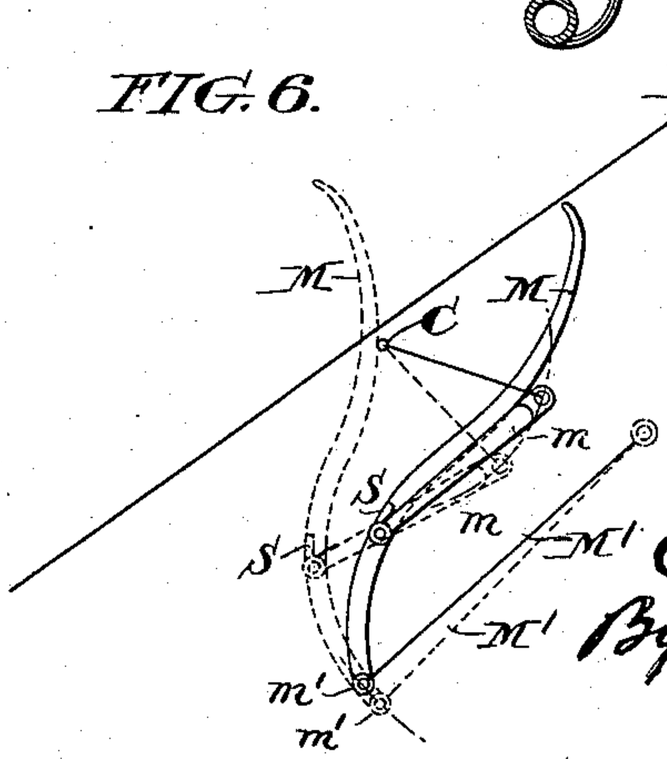


FIG. 6.



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UNITED STATES PATENT OFFICE.

EDWARD W. JENKINS, OF NORRISTOWN, PENNSYLVANIA.

GRAIN-BINDER.

SPECIFICATION forming part of Letters Patent No. 654,833, dated July 31, 1900.

Application filed July 20, 1898. Serial No. 686,402. (No model.)

To all whom it may concern:

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

My invention has reference to grain-binders; and it consists of certain improvements which are fully set forth in the following specification and shown in the accompanying drawings, which form a part thereof.

The object of my invention is to provide an automatic packing, binding, and discharging mechanism suitable for harvesting-machines.

In carrying out my invention I provide a suitable table over which the grain is fed and upon which it is packed by suitable packing-fingers having a rotary reciprocating motion at their free ends and adapted to pack the grain in a cradle formed by a rear retaining-arm which under the proper pressure of the bundle automatically falls away and liberates the bundle, the said movement being controlled by the action of the needle-arm, which is thrown into operation automatically after the bundle is suitably packed and attains its requisite size and firmness. My improved needle-arm is operated by means of a pinion and curved rack, the said parts being so arranged that when thrown into mesh the pinion operates with a curved rack at one side of said pinion to force the needle outward and around the bundle, and in continuing to mesh with the rack on the opposite side of the pinion the reverse operation is brought into play and the needle-arm is returned. This operation is accomplished by imparting a relative lateral movement between the pinion and the rack, the same being secured by the action of the packers in their operation upon the bundle. These packers are prevented from moving the pinion until a definite pressure is secured, at which time the tendency to movement overcomes a resisting-stop adapted to hold the pinion in a position out of gear with the rack of the needle-arm. Any other suitable means to operate the needle-arm from the shaft in place of the pinion and racks may be used, if desired. The operation of the needle-arm is also such that through suitable mechanism it causes the trip which sustains the cradle-arm to be thrown out of position, and thereby permit the bundle to force its way from the cradle and be discharged under the action of suitable kickers. The kickers are fingers which are brought forward below the table and their free ends then raised and moved backward in line with the bundle, so as to cause it to be bodily discharged. These kickers are directly operated by the needle-arm. They are movably connected and arranged to reciprocate in planes substantially parallel to the needle-arm and adapted to move across the axis of oscillation thereof, whereby the said kickers may have free and unobstructed movement close to the needle-arm and above and below its axis of oscillation.

Another portion of my invention relates to the means of operating the knotter. I arrange a stationary knotter above the bundle and provide a reciprocating block having a stud, said block being connected in any suitable manner with a movable part of the knotter. As the needle-arm moves over the block the stud thereof is received in a recess on the needle-head, and the continuous movement thereof causes the block to rise from the locking position until liberated and then be carried forward with the needle-head, and thus secure a positive motion to the knotter. In the reverse operation the backward motion of the needle-head brings the block to a position where it may again fall into its locking-recess and permit the needle-head to move on. Under this operation the knotter is again set and the machine is ready for future operation. This part of my improvement comprehends, broadly, the operating of a knotter independent of the needle-arm by the movements of the needle-arm.

My improvement embodies numerous details of construction in addition to the general features herein pointed out and will be better understood by reference to the accompanying drawings, in which—

Figure 1 is an end elevation of my improved grain-binder with small portions broken away. Fig. 2 is a plan view of the operating mechanism and with the knotter and its holder removed. Fig. 3 is a plan view of the knotter and its holder-frame which have been removed from the machine, as

pointed out with reference to Fig. 2. Fig. 4 is a side elevation of the needle-head. Fig. 5 is an elevation of one of the packers, and Fig. 6 is a diagram illustrating the kicker mechanism for discharging the bundles.

A represents the elevating devices of the harvesting-machine and may be of any suitable construction. They discharge the cut grain upon the upper end of the inclined table B. Pivoted at C on a fixed frame H, arranged immediately under the table, is the needle-arm D. This needle-arm is fully illustrated in Figs. 1 and 4. It is provided with a head *d*, having an oblique notch or slot *d'* for operating the knotter, as hereinafter described. The pivot-bearing of the needle-arm is very short, so as to permit the free passage of the kickers or discharging-arms over its ends and parallel to the needle-arm. The body portion of the needle is provided with a curved slotted portion concentric with the axis of rotation C and having its opposite sides and the rear end provided with teeth constituting a U-shaped rack. The pinion D^2 is adapted to mesh with this rack and is secured to the end of a driving-shaft J. The driving-shaft J may be rotated in any suitable manner from the fixed part of the machine and terminates in two cranks L L, arranged at one hundred and eighty degrees apart and provided with the pinion D^2, interposed between the said cranks. The end of this shaft J, adjacent to the cranks, is journaled in a movable frame J', which is pivoted to the fixed or stationary frame H at T'. This frame permits the pinion to be moved over into mesh with one end of the rack D' under the action of the packed bundle, but normally is held out of such contact by means of a shoulder or arm J^3, carried on the end of the torsional spring J^4, whose spring action is adjusted by a suitable adjusting device J^5. The locking-arm J^3 may also be provided with an arm or finger J^6, extending up into the path of the packed grain, so as to be acted on thereby and assist at the proper time in liberating the frame J'.

K K are two packers respectively pivoted at or near their middle portions to the two cranks L, and their rear ends are connected by links *k* with the fixed frame H. The operation of these packers is such that the packing ends are caused to describe ovals and force down the grain into the cradle until it is sufficiently packed or compressed to create a pressure against the said packers capable of pressing the shaft J rearwardly and forcing the arm J' from under the action of the shoulder of arm J^3. When this is done, the pinion D^2, which is constantly rotating, causes the needle to rise and pass over into a position above the knotter E. The continued operation of the pinion then returns the needle by the pinion meshing with the rack opposite to that with which it first engaged. If desired, this tripping action may be facilitated and made to be more positive by extending the arm J^3, as indicated at J^6, so that its rear end projects above the table A within the cradle and adapted to be directly pressed upon by the grain being packed. It will be evident that broadly considered it is only essential to my invention that there shall be a relative movement between the rack portion of the needle and the pinion, so as to insure the proper engagement and disengagement. I would remark here that as soon as the bundle has been discharged the pinion and its supporting-arm J' readjust themselves and the parts again and assume the locked position indicated in Fig. 1 automatically.

F is a fixed frame forming the upper part of the cradle and is connected to the tubular frame G at F^2 and also at the extreme upper end to the main frame of the harvesting-machine at F^3. The lower end of the frame F is free and contains the knotter E, of any suitable construction. This knotter is adapted to rock and is provided with an operating-block E', having an oblique pin *e* on its upper end. When the needle-arm is in the position shown in Fig. 1, the block is seated in the recess in the upper part of the overhanging frame F and is held against movement by a shoulder F' thereof. When the needle advances, the pin *e* is received in the oblique slot *d'* on the head D of the needle, and this causes the block to rise to make a connection with the needle-head and then be drawn forward to the position indicated in dotted lines in Fig. 1. The result of this is to rock or reciprocate the knotter. When the needle-arm returns, the block is pushed backward and automatically drops again into the recess F', and the needle-head goes backward without further connection with the knotter. It is immaterial to my invention what the particular means for insuring this automatic connection of the needle-head with the knotter may be.

I is the cradle-arm and is pivoted on the shaft C concentric with the pivot of the needle-arm. This arm is curved, as indicated, and its free end *i* is adapted to fit into the end of the overhanging arm F, so as to steady the knotter when under the action of the needle-head. The near end of the arm I is provided with a projection I', which normally rests against the end of a locking-pawl J^7, pivoted to the main frame at J^8. This holds the arm I up against the pressure put upon it by the packed grain, and the pawl J^7 is maintained in such locking position by the projection *c'* of the needle-arm. When, however, the needle-arm has been raised fully about the bundle, the shoulder *c* on the needle-arm adjacent to its pivot strikes the pawl J^7 and draws it to one side, so as to quickly liberate the cradle-arm I and permit it to fall out of the way by gravity and the forward pressure imparted to the bundle. When, however, the needle-arm returns to its lowermost position, it presses upon the pawl J^7, and the pawl in turn presses upon the projection I', so as to force up the cradle-arm I again into a position to

constitute the cradle, as indicated in Fig. 1. It will thus be seen that the operations of the various parts are purely automatic. It is evident that the arm I need not extend into contact with the rear end of the frame F, as indicated at *i*, but it is preferable to form this connection so as to steady the knotter and to resist any springing action during the knotting operation when the needle-arm has been driven forward.

As the grain is forced into the cradle under the action of the two alternately-operating packers K K it is caused to advance in front of the teeth or claws f^b, respectively arranged upon the adjacent sides of the frame F of the table B. In this manner the grain may freely pass into the cradle, but its backward movement is resisted.

M represents kickers or discharging-arms. They are pivoted at one end to a bell-crank lever M′, jointed or hinged to the lower end of the frame J′. The other end of the bell-crank lever M′ is formed with a claw adapted to make a locking connection with the frame H, as at M^2, this connection being positive when in the act of discharging the bundle and upon the return movement of the needle-arm. The kickers M are furthermore jointed to the needle-arm D by connecting-links *m*, the said links being pivoted to the needle-arm near the rear end and at a distance from its center of rotation, and at the opposite ends said links *m* are hinged to the kickers intermediate of its two ends, as clearly shown in Fig. 1. The operation of this kicker is such that when the needle-arm is being forced forward in the act of binding the link *m* pulls the kicker forward, and as at this time the pinion and its frame J′ are moved to the right the bell-crank lever M′ will be free at the point M^2. Under this condition the kicker is driven downward and under the table to a position such that its free end passes above the bundle and upward. As the pinion D^2 follows the rack at the right-hand end of the needle-arm the frame J′ is swung upward and locks the bell-crank lever M′ at the point M^2 on the stationary frame H Now upon the return movement of the needle-arm the kicker-arms M are positively thrown backward, moving about the pivot-point M′ as a fixed center, and thereby causing the upper or free end of the kickers to press positively upon the bundle and discharge it downward and outward, the cradle-arm I having previously dropped out of position. In doing this the kickers pass across the pivot-axis of the needle-arm. As soon as the needle-arm commences to rise the links *m* begin the forward motion and drag forward the kickers M. To prevent, however, too great movement of the kickers M toward the links *m*, I provide stops *s*, which limit the relative horizontal movement of these two parts, so that as soon as they become locked the pivot-point *m*′ of the bell-crank lever is caused to descend and swing said bell-crank lever to accommodate itself to the backward movement of the kicker. The full rear movement is shown in Fig. 1, while the full forward movement is shown in Fig. 6, together with the intermediate position indicated in dotted lines.

The frame G, as shown in the illustrations, is made tubular and at one end is bent over into a U shape. The stationary frame H is rigidly secured to the lower horizontal arm in this frame, while the upper arm F is secured to the upper arm of said U-shaped frame.

I have illustrated my improvements as I prefer to actually construct them in practice; but it is to be understood that equivalent constructions may readily be substituted for those here shown. Hence I do not limit myself to the minor details, since it is apparent that they might be modified in various ways without departing from the essential principles of my invention.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a grain-binder, the combination of a table and overhanging knotter-frame between which and the table the bundle is formed, and the pivoted cradle-arm having one end pivoted independent of the knotter-frame adjacent to the table and the other end free and adapted to swing so as to form a temporary connection with the knotter-frame and between the table or its frame and the knotter-frame whereby the latter is steadied.

2. In a grain-binder, the combination of a table and overhanging knotter-frame, between which and the table the bundle is formed, the pivoted cradle-arm having its free end adapted to swing upward from the table and form a temporary connection with the free end of the knotter-frame, whereby the latter is steadied, a knotter carried upon the free end of the knotter-frame, and a pivoted needle-arm hinged adjacent to the table and adapted to operate the knotter when fully raised.

3. In a grain-binder, the combination of a table and overhanging knotter-frame between which and the table the bundle is formed, the pivoted cradle-arm having its free end adapted to swing upward from the table and form a temporary connection with the free end of the knotter-frame whereby the latter is steadied, and retaining teeth or claws extending respectively from the adjacent sides of the table and overhanging knotter-frame to prevent the backward movement of the grain being packed.

4. In a grain-binder, the combination of the table, an overhanging frame arranged above the table, a pivoted cradle-arm hinged adjacent to the table and having its free end adapted to form a connection with the free end of the overhanging arm, a pivoted needle-arm pivoted at or adjacent to the pivot of the cradle-arm, a lock for holding the cradle-arm in an elevated position adapted to be drawn

into locking and unlocking positions by the moving needle-arm.

5. In a grain-binder, the combination of the table, an overhanging frame arranged above the table, a pivoted cradle-arm hinged adjacent to the table and having its free end adapted to form a connection with the free end of the overhanging arm, a pivoted needle-arm pivoted at or adjacent to the pivot of the cradle-arm, and means for positively raising the cradle-arm operated by the needle-arm when the latter descends to pass out of action.

6. In a grain-binder, the combination of a rotating shaft having two cranks arranged at an angle apart and laterally disposed to leave a space between them in the length of the shaft, two packers arranged to be operated by the cranks respectively, a movable needle-arm interposed between the packers, and connecting power devices between the needle-arm and the shaft intermediate of the cranks whereby the needle-arm may be positively moved between the packers.

7. In a grain-binder, the combination of a pivoted needle-arm having a pair of segmental racks, a rotating pinion adapted to mesh with said racks successively to cause the needle-arm to be reciprocated, a movable support for said pinion, a locking mechanism for holding the pinion out of mesh with the racks, and means operated by the pressure of the bundle being bound to shift the pinion into mesh with the racks, whereby the needle-arm is caused to operate as soon as the grain is sufficiently packed to form a bundle.

8. In a grain-binder, the combination of a pivoted needle-arm having a pair of segmental racks, a rotating pinion adapted to mesh with said racks successively to cause the needle-arm to be reciprocated, a movable support for said pinion, a locking mechanism for holding the pinion out of mesh with the racks, and means consisting of a movable shaft having cranks for rotating the pinion, and movable packer-arms hinged to the cranks and operated upon by the pressure of the bundle being bound to shift the pinion into mesh with the racks, whereby the needle-arm is caused to operate as soon as the grain is sufficiently packed to form a bundle.

9. In a grain-binder, the combination of a pivoted needle-arm having a pair of segmental racks, a rotating pinion adapted to mesh with said racks successively to cause the needle-arm to be reciprocated, a movable support for said pinion, a locking mechanism for holding the pinion out of mesh with the racks having an extension adapted to be acted upon by the bundle to release the lock when the bundle is sufficiently formed, and means operated by the pressure of the bundle being bound to shift the pinion into mesh with the racks, whereby the needle-arm is caused to operate as soon as the grain is sufficiently packed to form a bundle.

10. In a grain-binder, the combination of a rotating shaft having upon one part two cranks arranged at an angle apart, a pinion secured to the shaft intermediate of the cranks, a pivoted needle-arm having a segmental slot provided with racks in which the pinion operates to reciprocate the needle-arm, and pivoted packer-arms journaled upon the cranks and arranged respectively upon each side of the needle-arm.

11. In a grain-binder, the combination of a rotating shaft having two cranks arranged at an angle apart, a pinion secured to the shaft intermediate of the cranks, a pivoted needle-arm having a segmental slot provided with racks in which the pinion operates to reciprocate the needle-arm, pivoted packer-arms journaled upon the cranks and arranged respectively upon each side of the needle-arm, and a movable bearing for the shaft with its cranks and pinions adapted to be moved under the pressure of the bundle to throw the pinion into mesh with the racks of the needle-arm.

12. In a grain-binder, the combination of a shaft having two cranks arranged at an angle apart, packing-arms pivoted to said cranks so as to operate alternately upon the grain, a pivoted needle-arm arranged intermediate of the cranks and packers, a movable support for the crank-shaft moved under the pressure of the bundle, and means between the crank-shaft and the needle-arm for intermittently operating the needle-arm upon the completion of the packing of the bundle.

13. The combination of a binder-arm, a guideway through which the grain is guided in being bound, a fixed frame and knotter arranged upon one side of the said guideway, and a pivoted cradle-arm pivoted at the opposite side of the said guideway and having its free end adapted to swing across said guideway so as to form a temporary connection with the fixed frame whereby it simultaneously acts as a cradle and a steadying-support for the knotter-frame while the bundle is being bound.

14. In a harvesting-machine, the combination of means for packing and binding a bundle, a pivoted kicker or discharge-arm connected at one end to a pivoted lever and at an intermediate point in its length to the needle-arm by a link, means to lock the lever to form a fixed pivot-bearing for one end of the kicker, and means operating by the pressure of the bundle being bound for throwing said locking mechanism into or out of action whereby in the forward motion of the needle-arm the lock is out of action and the kicker passes under the bundle, while in the return motion of the needle-arm the lock is in action and the kicker is caused to swing about a fixed pivot and thereby describe a path in line with the bundle to discharge it.

15. In a grain-binder, the combination of a stationary frame, a needle-arm pivoted to the frame, a kicker M connected to the needle-arm by a link *m*, a bell-crank lever M′ connected to one end of the kicker and provided

with a locking connection M^2 with the fixed frame, a movable support for the bell-crank lever M′ to move it whereby the locking connection M^2 is thrown into or out of operation, and means operated upon by the bundle for operating the movable support whereby in the forward motion of the needle-arm when the bundle is thoroughly packed the bell-crank lever is free to oscillate and the kicker passes under the bundle, while in the return movement the bell-crank lever is retained in locking connection with the fixed frame and forms a fixed connection about which the kicker swings in discharging the bundle.

16. In a grain-binder, the combination of a pivoted needle-arm, a journal or bearing about which it oscillates, two kickers or arms movably connected and arranged to reciprocate in planes substantially parallel to the needle-arm and adapted to move across the axis of oscillation thereof whereby the said kickers may have free and unobstructed movement close to the needle-arm and above and below its axis of oscillation and a connection between said kickers and the needle-arm whereby they derive their motion from said needle-arm.

17. In a grain-binder, the combination of a pivoted needle-arm, a journal or bearing about which it oscillates, two kickers or arms movably connected and arranged to reciprocate in planes substantially parallel to the needle-arm and adapted to move across the axis of oscillation thereof whereby the said kickers may have free and unobstructed movement close to the needle-arm and above and below its axis of oscillation, and connecting devices between the needle-arm and the kickers whereby the movement of the needle-arm positively moves the kickers.

18. In a grain-binder the combination of an oscillating knotter, a movable needle-arm adapted to pass adjacent to but out of contact with the knotter, and a reciprocable part connected to the knotter to operate it and intermittently locked to and moved by the needle-arm for positively operating the knotter.

19. In a grain-binder, the combination of a knotter-frame F having a shoulder F′, a knotter carried thereby, a pivoted block E′ for operating the knotter provided with an oblique pin or stud *e* and normally held against operation by the shoulder F′, a movable needle-arm having a head *d* formed with a recess or aperture *d′* adapted to receive the pin *e*, whereby in the forward movement of the needle-head the pin enters the aperture in the head and raises the block E′ clear of the shoulder F′ and moves it forward to operate the knotter, and upon the return movement the head draws the block backward until it again falls back of the shoulder and withdraws the pin from the aperture in the head.

20. In a grain-binder, the combination of a pivoted needle-arm, two oscillating racks for moving said needle-arm, a power-shaft, a pinion on said shaft for meshing alternately with said racks, a movable support for the power-shaft moved under the pressure of the bundle, and suitable means for packing the bundle to the required density to operate the movable support.

21. In a grain-binder the combination of a pivoted knotter having an extended arm, a movable piece hinged to said arm and adapted to rock it to move the knotter, a pivoted needle-arm adapted to move past the knotter and means causing the needle to positively connect with the movable piece when in the vicinity of the knotter to cause the latter to be operated and automatically to detach itself on the reverse movement whereby the knotter is operated from the needle-arm but without direct connection therewith.

22. In a grain-binder the combination of a pivoted needle-arm, two reciprocable racks for moving said needle-arm, a driving-pinion journaled between said racks and adapted to mesh alternately with said racks to insure a reciprocating movement to the needle-arm, means to hold said racks and pinion out of gear operated by the pressure of the bundle to put said racks and pinion into gear, and suitable means for packing the bundle to the required density.

23. In a grain-binder the combination of a pivoted binder-arm provided with a curved rack at a distance from its axis, a pinion of relatively-small diameter adapted to mesh with the rack for operating the binder-arm, a rotating shaft for operating the pinion, means for causing the pinion and rack to be intermittently moved into and out of operative connection, pivoted reciprocating packing devices, and means controlled by the packing devices for causing the said pinion to operate the binder-arm when the proper amount of grain has been packed into a bundle.

24. In a grain-binder the combination of two packers laterally disposed so as to leave a space between them, a movable binder-arm pivoted so as to move through the space between the packers and provided with a gear or rack having its center of curvature coincident with the pivot of the binder-arm, a rotating shaft for rotating both the binding-arm and the packers and a gear carried by the said packer-shaft for directly actuating the binder-arm from the packer-shaft.

25. In a grain-binder the combination of a rotating shaft, a packing device operated thereby, a needle-arm having a pivot about which it oscillates, and power devices carried on the packer-shaft connecting directly with said needle-arm at a distance from its axis and interposed between said arm and the shaft, whereby the needle-arm may be directly operated by said shaft.

26. In a grain-binder the combination of a rotating shaft, a packing device operated thereby, a needle-arm having a pivot about which it oscillates, and kickers or discharge-arms linked to the main frame and movably connected to said needle-arm so as to shift

bodily and arranged to reciprocate bodily with said arm, and connecting power devices between the needle-arm and the shaft whereby the needle-arm may be operated by said shaft and thereby operate the kickers.

27. In a grain-binder the combination of a pivoted needle-arm, a journal or bearing about which it oscillates, and kickers or discharge-arms movably supported so as to float and shift their positions bodily and arranged to reciprocate in planes parallel to the needle-arm, and connecting devices between the needle-arm and the kickers whereby the movement of the needle-arm positively moves the ends of the kickers across the axis of rotation of the needle-arm.

In testimony of which invention I hereunto set my hand.

E. W. JENKINS.

Witnesses:
R. M. HUNTER,
J. W. KENWORTHY.