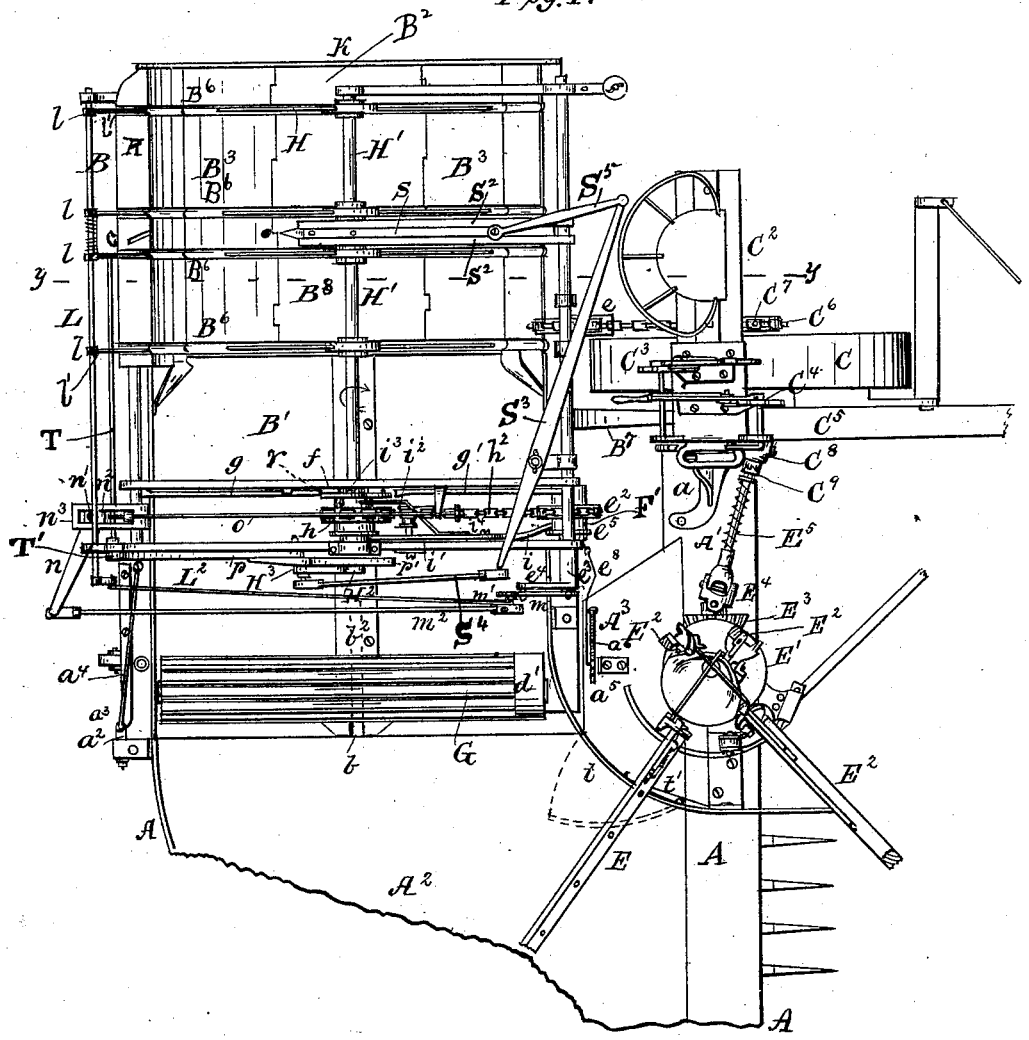
(Model.) 7 Sheets—Sheet 1.

A. ROSS & S. J. PARKER.

SELF BINDING HARVESTER.

No. 345,650. Patented July 13, 1886.

Fig. 1.



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(Model.) 7 Sheets—Sheet 2.

A. ROSS & S. J. PARKER.

SELF BINDING HARVESTER.

No. 345,650. Patented July 13, 1886.

Fig. 2.

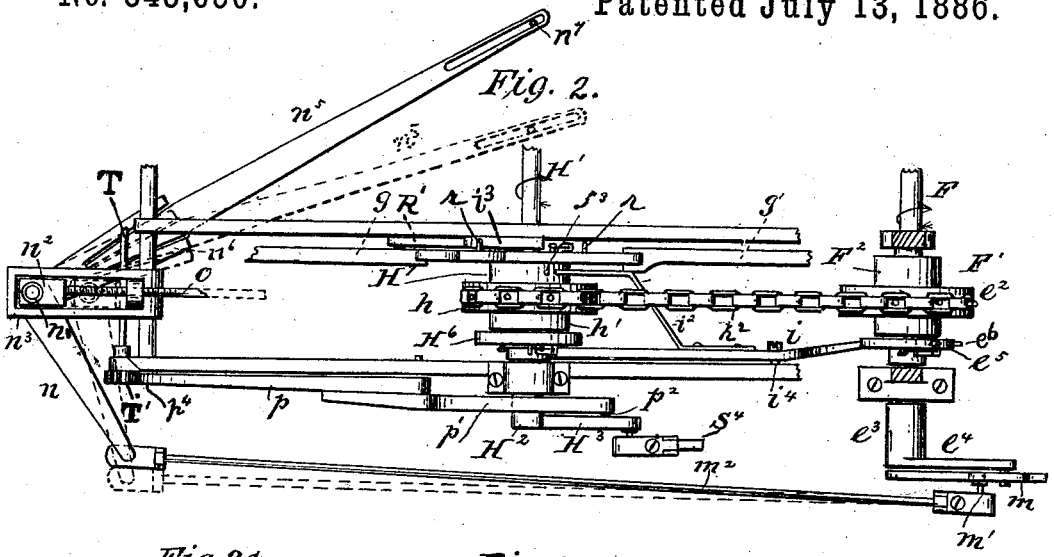


Fig. 20.

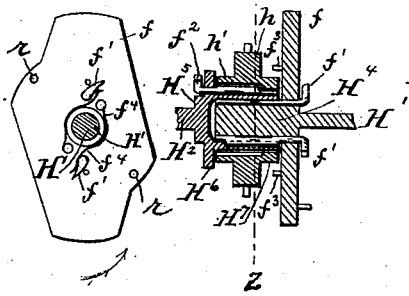


Fig. 21.

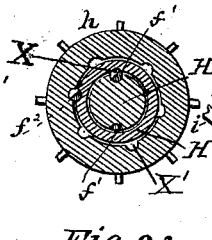
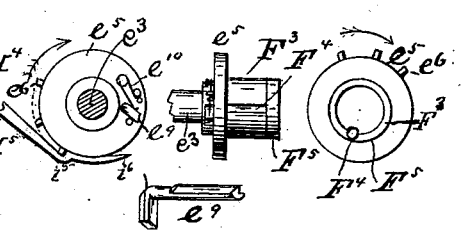


Fig. 22.



Figs. 8.

Fig. 24.

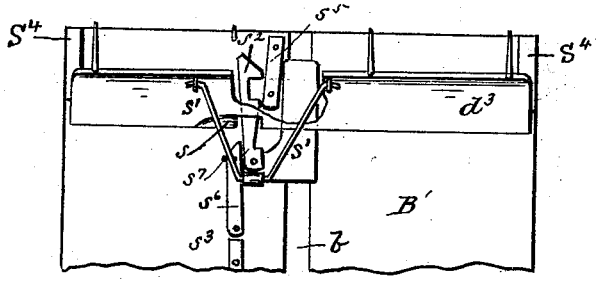


Fig. 23.

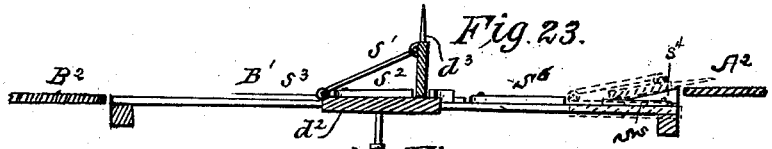
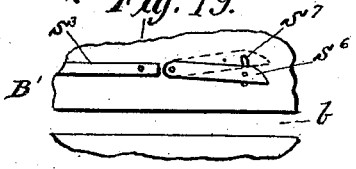


Fig. 19.



Witnesses.
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(Model.) 7 Sheets—Sheet 3.

A. ROSS & S. J. PARKER.

SELF BINDING HARVESTER.

No. 345,650. Patented July 13, 1886.

Fig. 3.

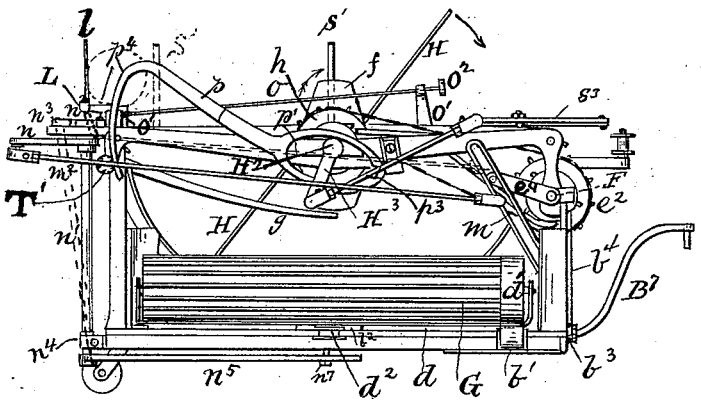


Fig. 4.

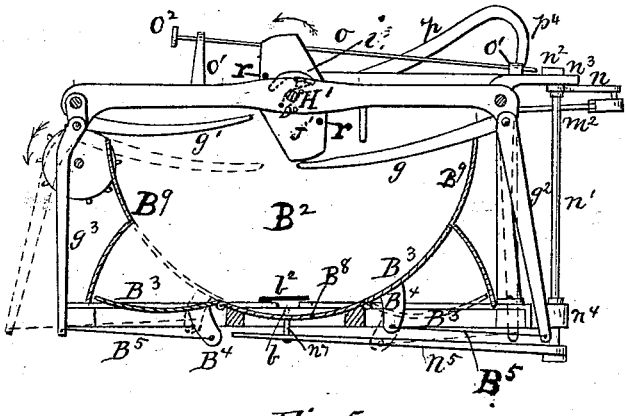
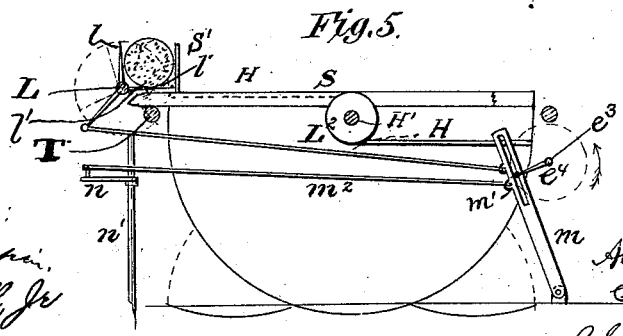


Fig. 5.



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7 Sheets—Sheet 4.

A. ROSS & S. J. PARKER.

SELF BINDING HARVESTER.

No. 345,650. Patented July 13, 1886.

Fig. 6.

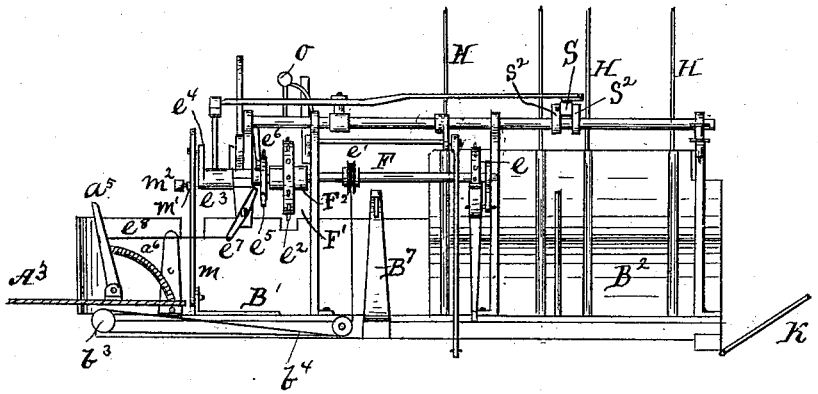


Fig. 7.

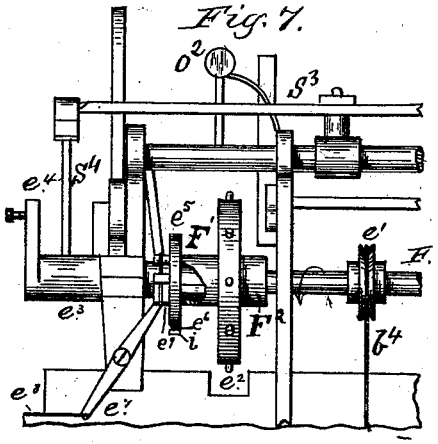
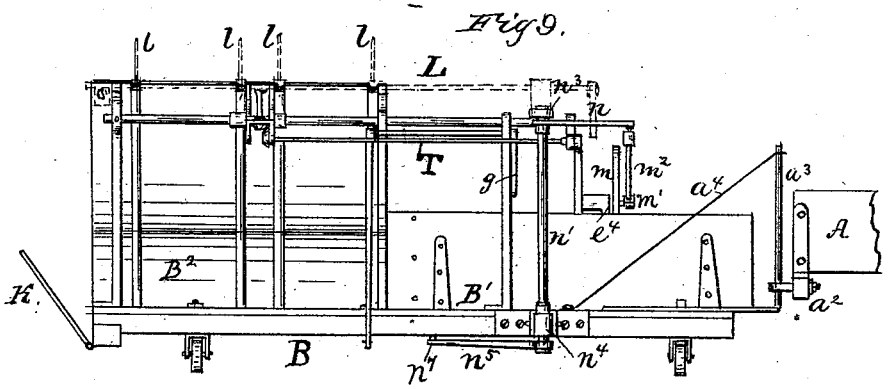


Fig. 9.



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7 Sheets—Sheet 5.

A. ROSS & S. J. PARKER.

SELF BINDING HARVESTER.

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Fig. 10.

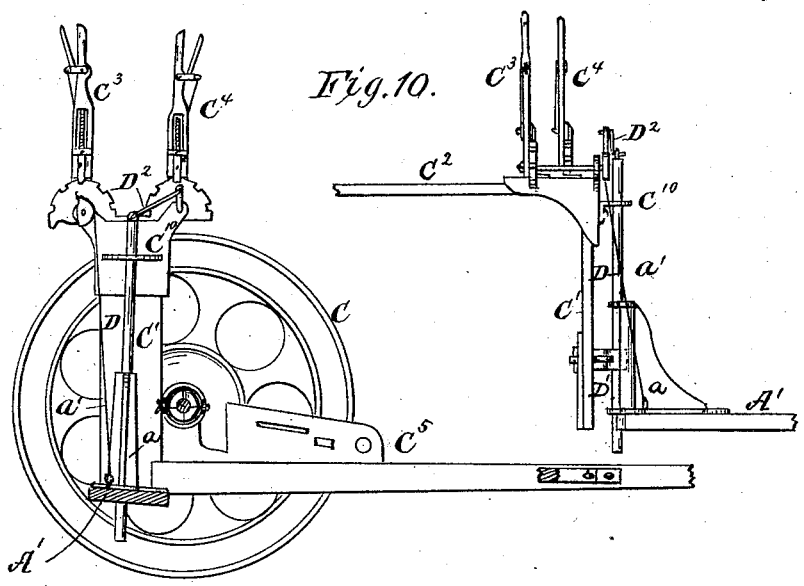


Fig. 11.

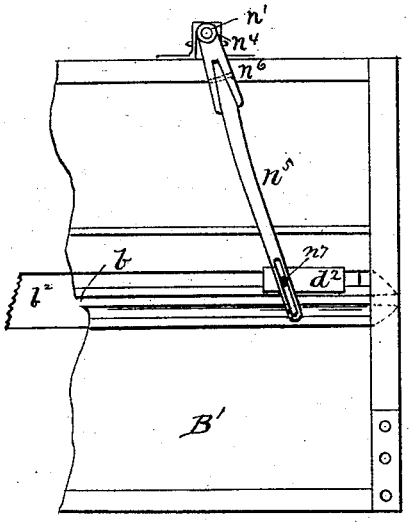
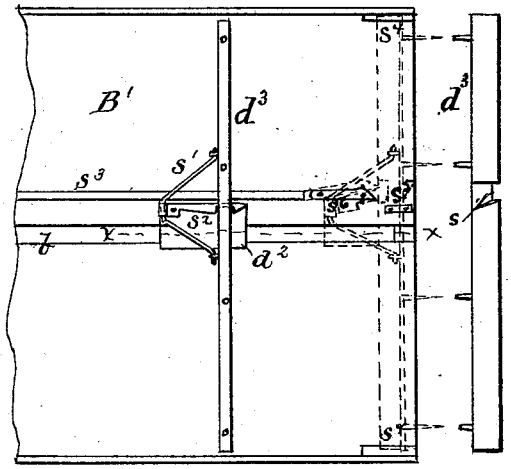


Fig. 12.



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7 Sheets—Sheet 6.

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SELF BINDING HARVESTER

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Fig. 13.

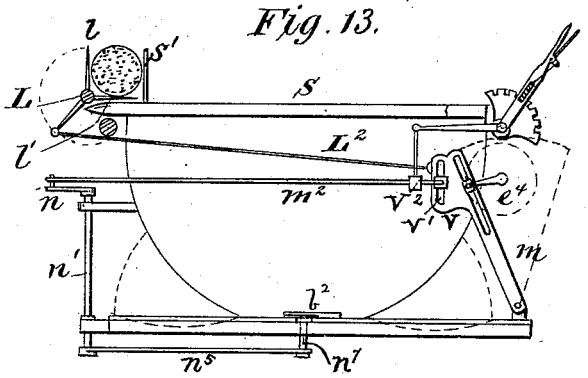


Fig. 14.

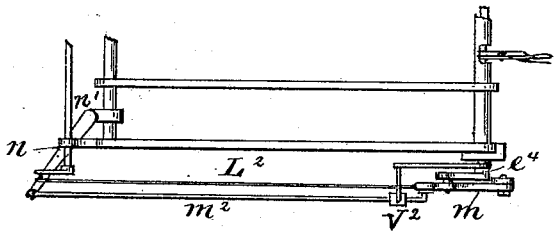
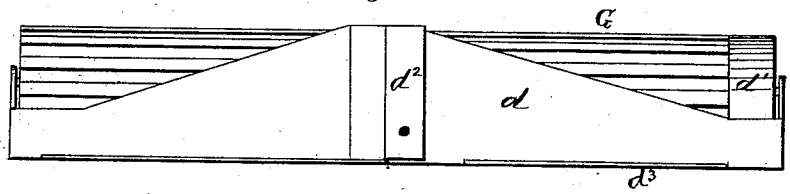


Fig. 15.



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(Model.)

7 Sheets—Sheet 7.

A. ROSS & S. J. PARKER.

SELF BINDING HARVESTER.

No. 345,650. Patented July 13, 1886.

Fig. 16.

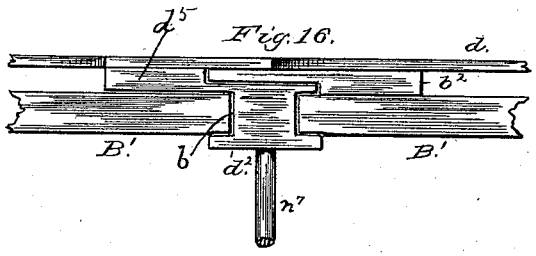


Fig. 17.

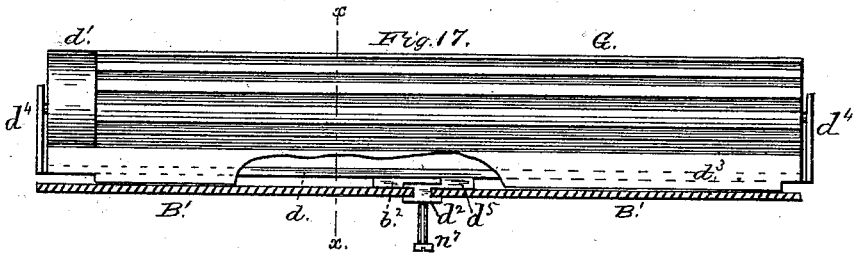
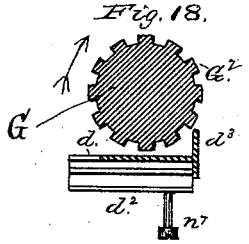


Fig. 18.



WITNESSES

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UNITED STATES PATENT OFFICE.

ALEXANDER ROSS AND SAMUEL J. PARKER, OF ROCHESTER, NEW YORK.

SELF-BINDING HARVESTER.

SPECIFICATION forming part of Letters Patent No. 345,650, dated July 13, 1886.

Application filed February 4, 1881. Serial No. 25,377. (Model.)

To all whom it may concern:

Be it known that we, ALEXANDER ROSS and SAMUEL J. PARKER, citizens of the United States, residing at Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Self-Binding Harvesters; and we do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

Our invention relates to self-raking and self-binding harvesters. The grain is swept heads foremost from the reaper platform or apron onto an intermediate platform, and from the intermediate platform it is pushed heads foremost by a rake into the grain-receptacle or gaveler-platform, from which it is lifted by a rake rotating intermittingly and presented to the binding mechanism, where it is bound into bundles.

The invention consists in the construction and combination of the several parts hereinafter fully described, and pointed out in the claims.

In the drawings, Figure 1 is a plan of a self-raking reaper and self-binding attachment constructed in accordance with our invention. Fig. 2 is a detail plan view, on an enlarged scale, of the operating mechanism, showing the devices whereby intermittent movements are imparted to the binder mechanism, also the shifting bearing for regulating the throw of the rake. Fig. 3 is an elevation of the end of the binder attachment next to the reaper-platform. Fig. 4 is a vertical section of the binder attachment on the line *y y*, Fig. 1, looking from the outer end thereof, several of the operating parts being omitted in order that those which are shown may appear more clearly. Fig. 5 is an elevation, partly in outline, of the inner or receiving end of the binder attachment, showing the slotted pivoted arm and other mechanism. Fig. 6 is a front elevation of the binder attachment, showing also a small portion of the reaper-platform. Fig. 7 is a front elevation, on an enlarged scale, of the clutch on the main driving-shaft, whereby an intermittent movement of the rake and the mechanism which holds and discharges the bundles is secured. Fig. 8 shows the same clutch in detail. Fig. 9 is a rear elevation of the binder attachment. Fig. 10 is a side elevation of the driving-wheel, the frame, and the mechanism for raising and tilting the reaper-platform. Fig. 11 is a view of the under side of a portion of the intermediate platform, showing the sweep-arm for operating the rake. Fig. 12 is a view of the upper side of the intermediate platform, showing a modified form of the rake. Fig. 13 is an elevation of the receiving end of the binder attachment, partly in outline, showing the connecting rods or pitmen, the pivoted swinging arm, and a modification of the means for controlling the throw of the rake. Fig. 14 is a plan of part of the mechanism shown in Fig. 13. Fig. 15 is a view of the under side of the rake and roller. Fig. 16 is an enlarged detail view showing in elevation a portion of the receiving end of the intermediate platform, the end of the strip or plate which covers the slot in said platform, an end view of the carrier to which the rake is made fast, and a portion of the bar or plate which carries lugs for supporting the roller. Fig. 17 is a front elevation of the rake and a roller with a portion of the butt-board broken away and the intermediate platform in section. Fig. 18 is a cross-section, on the line *x x* in Fig. 17, with the intermediate platform omitted. Fig. 20 shows a cam-plate fixed on the rake-shaft H′. Fig. 21 is a vertical longitudinal section through the clutch which operates the rake-shaft H′. Fig. 22 is a vertical cross-section through the same on line *z z*, Fig. 21. Figs. 19, 23, and 24, show in detail the modified rake illustrated in Fig. 12.

In the accompanying drawings, A is the harvester-frame, B the binder-frame, and C the driving-wheel. A vertical bar, C′, is supported on the inner end of the axle of the drive-wheel. The upper end of this bar is above the plane of the periphery of the driving-wheel, and has affixed thereto a horizontal bar, C^2, which extends over the said wheel. To this horizontal bar the driver's seat and the lifting and tilting levers C^3 C^4 are affixed. The tongue C^5 is fixed to the vertical bar C′, near the lower end of the latter.

On the outer or left-hand end of the axle of the driving-wheel is fixed a sprocket-wheel or

other suitable pulley, C^6, around which runs a chain or band, C^7, which actuates the main driving-shaft F on the binder-frame B hereinafter described. A guide, C^{10}, is fixed near the top of the standard C', and supports and holds in proper position the tilter bar or lever D, the lower portion of which is held in the eyebolt D', which turns readily in its bearing on the vertical bar C'. The tilter-bar D is connected by a rod, D^2, to a crank-arm extending from the fulcrum of the lever C^4, which is turned forward or back for the purpose of tilting the reaper-frame, as hereinafter explained.

The harvester-frame A is provided with an arm, A', arranged at its front side and projecting laterally in line with the finger-bar, the end of said arm being close to the standard C'. A bracket, *a*, is fixed upon the inner end of the arm A', and is provided with suitable eyes or bearings adapted to hold the tilter bar or lever D. The bracket slides up and down on the tilter-lever and permits the harvester-frame to be raised or lowered by means of the lever C^3 and the connecting chain or rod *a'*.

The harvester-frame A and the binder-frame B are distinct from each other, but are coupled together in such a manner that the harvester-frame can be raised or lowered or tilted at the will of the driver without disturbing the binder-frame. They are coupled together at their rear adjacent corners by means of an eyebolt, a^2, and a vertical rod, a^3. The eyebolt slides on the rod, and thus permits the raising or lowering of the harvester-frame. The rod a^3 is braced by the rod a^4. The driving-wheel is arranged in front of and nearly in a line with the center of the binder-frame. A reach or arm, B^7, is secured to the binder-frame, its forward end being provided with a hook or other means, whereby it is coupled to the standard C'. The reaper-frame and the binder-frame are arranged in the most compact form. The binder-frame abuts against the reaper-frame. The grain is swept from the delivery side of the reaper-platform onto the receiving end of the binder-frame. The forward portion of the reaper-platform is extended laterally in front of the receiving end of the binder-frame, as shown, whereby all the parts of the machine are brought into the closest relation to the driving mechanism, and are directly under the supervision of the driver. The binder-frame and its mechanism could, if desired, be detached from the reaper, and the latter could be used alone.

E' is a wheel for rotating the rakes E E^2. It is journaled on the top of a suitable post or standard fixed on the arm A' of the harvester-platform. The rakes are raised and lowered, in the ordinary manner, by cams or inclined surfaces, and they are driven by a pinion, E^3, meshing with the cogs on the under side of the wheel E'. To the shaft of the pinion E^3 is attached, by a universal joint, E^4, the shaft E^5, which is connected to the main axle by means of the clutch c^8 c^9 and another universal joint. A coiled spring is placed around the shaft E^5, which spring holds the part c^9 of the clutch in engagement with the part c^8. The mechanism for holding and driving the rakes being supported on the arm A', is tilted or raised or lowered with the harvester-frame, and the rakes are thus always preserved in proper relative position to the cutter-bar. The rakes E^2 act as beaters to incline the grain to the sickle. The rake E sweeps the grain from the harvester-platform onto the intermediate platform, and it also engages the end of the trip-lever a^5, which unlocks parts of the mechanism on the binder-frame, as hereinafter described.

An intermediate platform, B', and a folding grain-receptacle, B^2, are provided on the binder-frame B. The grain is swept heads foremost from the harvester-platform A^2 onto the intermediate platform. A rake pushes the grain, heads foremost, into the folding grain-receptacle. From the grain-receptacle the grain is lifted laterally to the band-tying mechanism. The intermediate platform, B', has a central longitudinal slot or opening, *b*, extending from end to end. It also has a pinion or small friction-wheel, *b'*, journaled at the inner front corner, next the harvester-platform, as shown. The pinion *b'* is driven by a pulley, b^3, and a cord or belt, b^4, running on a pulley, *e'*, on the main shaft F, which drives the binding mechanism. The slot *b* is covered by a strip or bar, b^2, which is so constructed and arranged as to have one edge secured to the platform at one side of the slot, and leave an open space between its other edge and the platform for the passage of an arm connecting the rake to the carrier, as hereinafter described. The rake is preferably composed of a supporting plate or bar, *d*, and vertical butt-board, d^3. Vertical supports d^4 are provided on the ends of the bar *d*, in which are bearings for the journals of a roller, G. The roller is so arranged that its periphery is about flush with or projects slightly beyond the butt-board d^3, as shown in Fig. 18. On one end of the roller is fixed a gear or friction wheel, *d'*, arranged to engage with and be revolved by the pinion or friction wheel *b'* when the rake is at the receiving end of the platform B'. The grain, when swept from the harvester-platform, passes over the roller, which aids in its delivery onto the platform B' in front of the rake or butt-board d^3. The harvester-rake E will leave the grain with the butts about flush with or slightly beyond the edge of the harvester-platform. The longitudinal ribs or projections G^2 on the roller move the grain onward over said roller until it drops with the butts lying in front of the butt-board d^3. The rake-carrier d^2 passes down through the slot *b*, and is provided with guide-channels in its edges, which fit over the adjacent edges of the two parts of the platform B' on opposite sides of the said slot. Its upper surface is immediately under the strip b^2, and it has a

horizontal arm, d^5, which projects outward through the open space between the said strip and the platform. The supporting-bar d of the rake and roller is fixed to this projecting arm. The carrier d^2 is connected to an actuating sweep-arm, n^5, arranged below the platform B′, as hereinafter described. While the grain is being swept by the rake E from the harvester-platform the rake d^3 and the roller G will be in the position shown in Fig. 1. The roller will be rotated continuously while at this place. As soon as the grain is delivered, the rake E strikes the lever a^5, and the mechanism for operating the rake d^3 is thrown into gear, and the rake d^3 is moved to the opposite end of the platform B′, pushing the grain before it and delivering the same into the grain-receptacle B^2. The roller G ceases to rotate as soon as the forward motion of the rake d^3 begins, and it supports the butts of any stalks of grain that may rise above the top of the rake d^3.

A modified rake without a roller is shown in Figs. 12, 23, and 24. In this the rake or butt-board d^3 is supported so that it will drop down nearly to a horizontal position at the delivery end of the reaper-platform and at the receiving end of the intermediate platform, as shown in dotted lines, Fig. 23, to permit the grain to be swept thereover by the rake E. The said rake is made of a thin board having a series of teeth on its upper edge and a notch, s, near the middle of its lower edge. The rake is connected to the carrier d^2 by short pivoted arms s'. A latch, s^2, is fixed to the carrier, and is adapted to engage in the notch s and hold the butt-board in a vertical position. The latch is held in position by a small guide-strip, s^3, on the platform B′. When the rake is carried to its starting-point, on the receiving end of the intermediate platform, B′, the latch s^2 comes in contact with a small cam or projection, s^5, which disengages it, and the rake then drops forward, or toward the reaper-platform, onto side rests, s^4, to permit the grain to pass thereover onto the intermediate platform. The latch is thrown by the cam s^5 against a small swinging lever, s^6, pivoted on the platform. In the outward movement of the rake the lower edge of said rake strikes the tapered end of the swinging lever s^6, which brings the rake to an upright or vertical position, and the lever is drawn sidewise into the notch s, and by this movement the latch s^2 is caused to engage the rake and hold the same in its vertical position. The lever s^6 is limited in its movements by a small pin projecting from its lower surface through a small slot, s^7, formed in the platform B′. In this modification the rake E carries the grain over the reciprocating rake, as the latter in its inclined or resting position extends but slightly above or is nearly on a level with the delivery side of the reaper-platform, as clearly indicated in dotted lines in Fig. 23. The teeth of the rake extend but slightly over the reaper-platform, and act, in conjunction with the side rests, s^4, to limit the downward movement of the rake, thereby keeping the upper side of the same in nearly the plane of the reaper-platform, to permit the easy passage of the grain over the same onto the intermediate platform, the grain passing freely between the extended ends of the rake-teeth.

The grain-receiving platform or receptacle B^2 is made in sections, as shown, the two intermediate sections, B^3 B^3, being hinged to the middle section, B^8, so that they will lie down and form with the said middle section an approximately-flat platform flush with the platform B′. When the sections B^3 B^3 are raised, they, together with the middle section and the side sections, B^9 B^9, form a semi-cylindrical grain-receptacle, the curve of which corresponds to that described by the ends of the revolving rake-arms H, hereinafter described. The raising of the hinged sections gathers the said grain into a gavel which is lifted by the arms or teeth of the revolving rake. Transverse channels B^6 are formed in the concave receptacle. These channels run with the curvature of the receptacle and correspond in number to the number of the teeth on the revolving rake. The ends of the rake-teeth run in these channels a little below the surface of the receptacle, thereby insuring the taking up of every straw when the grain is being lifted to the binder table.

The main shaft F is journaled in bearings on the front of the binder-frame. It receives its motion by means of a sprocket-wheel, e, fixed upon it, and the chain C^7, hereinbefore described.

A clutch, F′, is arranged between the end of the continuously-rotating shaft F and the end of the shaft e^3 of the crank e^4, for the purpose of securing an intermitting motion to the latter. The end of the crank-shaft e^3 abuts against the end of the shaft F. A sleeve or hollow hub, F^2, is fixed on the end of the shaft F, and a sprocket-wheel, e^2, is carried thereby. An enlargement, F^3, formed on the abutting end of the crank-shaft e^3, fits snugly into the hollow hub F^2. A small disk, e^5, fixed on the shaft e^3, and against the shoulder of the enlargement F^3, fits snugly against the end of the hub F^2. The enlargement F^3 of the shaft e^3 has formed in it a longitudinal channel or groove, F^4, which is extended by a suitable hole through the disk e^5. A clutch-pin, e^9, is placed in the channel F^4, and its end projects through the disk e^5, and is bent to lie close against the latter, so that it will be engaged by an arm or lever, e^7, pivoted to the binder-frame. The clutch is engaged by the edge of the pin e^9 bearing against the inner surface of the sleeve F^2 on the shaft F. The clutch-pin is so formed that it may be turned into the channel F^4, and so disengage the sleeve F^2 from the enlargement F^3 on the shaft e^3; or it may be turned out, and said shafts F and e^3 be thereby locked together, so that motion will be given to the crank e^4. The outer bent end of the pin is pressed by a spring, e^{10}, by which the pin is normally held in engagement with

the sleeve F^2. When the bent end of the pin comes in contact with the lever e^7 the pin is turned out of engagement with the sleeve F^2, and the crank-shaft is thrown out of gear. The lever e^7 has connected to it one end of a rod, e^8, which has its other end attached to the trip-lever a^5, which is pivoted on the wing portion A^3 of the harvester-platform A^2. The upper end of said lever is arranged to be engaged by the rake E as the latter sweeps the grain from the harvester-platform. It is held in position by a spring, a^6, which throws it back to the position shown in Fig. 6 whenever it is released by the rake.

The rotating shaft or rake-head H′ of the rake H is journaled in cross-bars on the upper part of the binder-frame and vertically above a transverse line drawn through the middle of the grain-receptacle B^2 and platform B′. On the inner end of the shaft H′ there is fixed a cam-plate, f, so constructed and arranged that in each half-revolution of said shaft it will engage and move the ends of two levers, g and g', which extend to the rear and front, respectively, of the binder-frame, where they are fixed to rock-shafts having the arms g^2 g^3, which are connected by the links or rods B^5 B^5 with the lugs B^4 B^4 on the under side of the hinged sections B^3 B^3 of the grain-receptacle. When the cam-plate moves the levers g g', the sections B^3 B^3 are raised into the position shown in full lines on the right and dotted lines on the left in Fig. 4, and when the cam clears the levers the sections drop to a horizontal position. The end of the shaft H′ projects through the cam-plate f, and is coupled by an interposed double clutch, H^7, to the shaft H^2 of the crank H^3, by which motion is imparted to a needle hereinafter described.

The clutch H^7 is shown in its details of construction in Figs. 21 and 22. It is constructed as follows: A spindle or enlarged portion, H^4, is formed on the shaft H′ outside of the plate f, and has made in its periphery longitudinal channels adapted to receive the half-round clutch-pins f' f', passing through holes from the outer face of the plate f. A hollow sleeve, H^5, is fixed on the end of the shaft H^2, and fits snugly over the spindle H^4. The sleeve H^5 has on its inner surface the groove X. The springs f^4 act against the outer bent ends of the clutch-pin, so as to turn the latter into engagement with the groove X when said groove is brought into the proper position, thereby coupling together the shafts H′ and H^2. The clutch-pins are turned to uncouple said shafts by means hereinafter described. A sprocket-wheel, h, has its hub h' set loosely on the hollow sleeve H^5, the latter serving as a bearing for the former. The hub is held from moving laterally by the cam-plate f and an annular flange or rim, H^6, formed near the outer end of the sleeve H^5. The inner surface or bore of the hub is provided with the grooves X′. A half-round channel is formed in the periphery of the sleeve H^5, which receives a clutch-pin, f^2, the end of which projects through a hole in the rim H^6, and is bent as shown. A spring acts against the bent end of the pin f^2, to keep it normally engaged with the hub h'. By means of the clutch-pin f^2 the sprocket-wheel h engages with and gives motion to the crank-shaft H^2, and by means of the clutch-pins f' the sleeve H^5 may be coupled with the spindle H^4 on the shaft H′. Thus the rake-shaft H′ and needle-crank H^3 may be coupled together to act simultaneously, or the crank may be revolved while the shaft H′ remains stationary, and both the crank H^3 and shaft H′ may remain stationary by unclutching the sprocket-wheel h from the sleeve H^5. The sprocket-wheel h is revolved by a chain, h^2, running over the sprocket-wheel e^2 on the main shaft F. The shaft H′ is unclutched at each half-revolution by turning the two pins f', which are arranged on opposite sides of the spindle H^4.

i is a trip-lever pivoted to the binder-frame at i^4, its front end being depressed and passing under and in contact with the periphery of the disk e^5. The said lever has a short shoulder, i^5, formed near its end, and is provided with a tapering extension, i^6. The disk e^5 is provided with a series of radial pins, e^6. In the rotation of the disk the pins e^6 come in contact with the extension i^6 and depress the same, and thereby disengage the rear end of the trip-lever from the clutch-pin f^2. As soon as the pins e^6 clear the extension, the shoulder rises behind the last pin, as shown in Fig. 8, and thereby the rear end of the trip-lever is made to engage the clutch-pin f^2. The shoulder i^5 also prevents any possible reverse rotation of the disk e^5 by its position behind the last pin e^6.

Instead of the pins e^6, the disk e^5 may be provided with a solid projection, as indicated in dotted lines in Fig. 8.

The rear end of the trip-lever i extends to the crank-shaft H^2, and is arranged to engage with the outer bent end of the semi-cylindrical clutch-pin, f^2, thereby turning it and disengaging the crank-shaft from the sprocket-wheel h. A stop-arm, i^2, is secured to the trip-lever i, and is extended laterally and rearward, having its end arranged in position to engage on one or the other of the pins f^3 f^3, projecting from the face of the cam-plate f. The pins f^3 are arranged on opposite sides of the spindle H^4, so that the stop i^2 acts to stop the shaft H′ at each half-revolution. The object of this stopping mechanism is to insure exactness in the position of the revolving rake.

The intermittent movement of the rake H is secured by the clutch-pins f' f', arranged on opposite sides of the shaft H′, and engaged alternately at each half-revolution by a curved projection or cam, i^3, fixed upon the frame close to and parallel with the plate f, and arranged so that the bent ends of the pins f' pass thereunder, and are turned sufficiently to disengage them for a half-revolution from the sleeve H^5. The pins f' during the other half-revolution are held in engagement with the sleeve by small springs f^4, which press upon

their outer bent ends, as shown in Fig. 20. When the sprocket-wheel h and the sleeve H^5 are engaged, the latter makes one complete revolution before becoming disengaged. During the first half of this revolution the spring f^4 keeps one of the pins f' engaged in the groove X; consequently the shaft H′ is coupled, and the rake H makes a half-revolution, bringing the gavel up into the position for the needle to pass under it. At the end of the half-revolution the pin f' comes in contact with the curved cam i^3 and is disengaged. The other pin f' is then in the position occupied by the first pin before the half-revolution, and will come into the groove by the action of its spring when the groove is brought opposite it by the rotation of the sleeve H^5. The stop i^2 comes into contact with one of the pins f^3 just as the cam i^3 disengages the pin f'. The said stop is only for the purpose of aiding and supplementing the clutch-pin f', should it not act just at the proper time, and thus stop the rake-shaft H′ in the proper position.

m is a slotted arm having its lower end pivoted on the front side and inner end of the binder-frame. The wrist-pin of the crank e^4 passes through the slot in the arm, and the latter is thereby made to swing back and forth by the revolution of the crank.

Fixed to the arm m is a pin, m', to which the pitman m^2 is connected. The opposite end of the pitman m^2 is connected to the outer end of an arm, n, which is fixed to a vertical rock-shaft, n', journaled in the rear side of the binder-frame. The upper end of the rock-shaft n' is journaled in a box, n^2, supported in a slotted guide-frame, n^3, in which it slides forward and back. The distance through which it slides may be regulated by an adjusting-rod, O, which has its rear end threaded in the guide-frame, so that it may be turned in against the the box n^2, and the latter prevented from sliding entirely to the forward end of the guide-frame. By turning the rod so as to draw it toward the front of the binder-frame the space in which the box slides may be lengthened. The rod O has a proper front bearing on the binder-frame, and its forward end is extended within reach of the driver. The rock-shaft n', near its lower end, is journaled in a rocking or pivoted box, n^4. The said box rocks or turns sufficiently to adapt it to the shifting of the box n^2 on the upper end of the shaft. The rock-shaft n' extends below the box n^4, and has fixed on its end a horizontal arm, to which, at n^6, is pivoted the sweep-arm n^5, which extends under the intermediate platform, B′, and has its end slotted to receive the pin n^7 on the under side of the rake-carrier d^2. By means of the pivot in the sweep-arm, where it connects with the rock-shaft n', and by its arrangement close to the lower end of the rock-shaft, the said arm is held close to the under surface of the platform B′, notwithstanding the various inclinations of the shaft n'. The rake d^3, with its carrier d^2, is moved to and fro over the intermediate platform, B′, by means of the sweep-arm n^5. By means of the rock-shaft n', carried in the pivoted bearing, the arm n^5, and shifting box n^2, the movement of the rake d^3 is regulated. The rake may be made to move the whole length of the intermediate platform, or it can be made to stop short of the delivery end thereof, at the will of the driver. The revolution of the crank e^4, acting upon the rod or pitman m^2 and arm n, causes the bearing n^2 to vibrate to and fro, as explained. The change of the position in the rock-shaft n' is shown in dotted lines, Fig. 3.

The rock-shaft n' and its arms n and n^5 are so constructed and arranged that when the crank e^4 is in the position shown in Figs. 1 and 3, with the crank-pin thereof at its extreme limit of movement to the rear, the said arm n^5 will carry the rake to the inner or receiving end of the platform B′. These several parts are also so constructed and arranged that to bring the rake to the inner end of said platform the sliding box n^2 must be at the outer end of the slot in the frame n^3. If the sliding box be held stationary at the outer end of the frame n^3 by the set-rod O as shown in Fig. 2, the end of the arm n^5 will swing the entire length of the platform B′, and will carry the rake from the inner to the outer or delivery end thereof. Hence when the grain-stalks are short the sliding box is set and held at the outer end of the frame n^3, as shown in Fig. 2. When the stalks are long, the set-rod O is drawn forward more or less, according to the length of the stalks, so that the sweep-arm n^5, and consequently the rake d^3, will be stopped short of the platform B′, as indicated by the dotted lines in Fig. 2. By this arrangement the position in which the grain is left in the receptacle is varied according to its length, so that the band may always be placed around it in the proper position. It may be observed that the crank e^4 in its revolution passes above its center of motion and near the upper end of the slot in the arm m, when it removes the rake from the receiving to the discharging end of the intermediate platform, and passes under its center of motion and near the bottom of said slot and nearer the fulcrum of the arm m when it returns the rake. Hence by the revolution of the crank the rake is given a greater speed on its return stroke than when it is thrown from the receiving end of the platform toward the grain-receptacle.

The rock-shaft n', instead of being supported in the sliding and pivoted boxes hereinbefore described, may be journaled in ordinary fixed bearings, and the movements of the rake d^3 across the platform may be adjusted by the devices shown in Figs. 13 and 14. A wing or lug, V, having an inclined slot, V′, therein, is formed on the rear edge of the arm m. The pitman m^2 is connected to the lug V by a suitable bearing-pin passing through the slot. The slot V′ is inclined downward away from the arm m. The pin of the pitman may be adjusted up or down in the slot. The pitman is held in a carrier, V^2, which is sup-

ported by a suitable intermediate rod, a rock-shaft and a crank-arm connecting with a hand-lever under the control of the driver, by which means the pitman may be raised or lowered to regulate the length of stroke of the rake. The full-length stroke is secured when the end of the pitman is held at the upper end of the slot, and the stroke is shortened as the said end is adjusted toward the lower end of said slot.

The needle or band carrying arm S is supported above the grain-receptacle B^2. It slides between guides S^2 S^2, fixed upon the frame over the middle of and transversely to the said grain-receptacle. Its point slides immediately under the binder-table R (shown in Fig. 1) and carries the cord to the band-securing mechanism. The needle receives motion from the crank H^3 on the shaft H^2 through the pivoted lever S^3 and links or connecting-rods S^4 and S^5. The needle moves close to the shaft H′ of the rake H, in order to prevent interference between the teeth of the rake and the lever S^3. The crank H^3 makes one complete revolution while the rake H remains at rest, the lever S^3 being drawn forward out of the way of said teeth both at the beginning and end of the revolution. Between the revolutions of the crank H^3, and consequent reciprocations of the needle S, the shaft H′ and rake H make one half-revolution. This action is secured by the construction of the clutches hereinbefore described. Disks are fixed upon the rake-shaft H′, and the teeth of the rake are fixed on the peripheries of these disks at points diametrically opposite, and project in opposite directions in lines tangential to said disks. The two sets of teeth are thus situated in different planes, so that the set which lifts the grain will come into the same plane, or flush with the binder-table R and the upper surface of the needle, and the other set, projecting toward the front of the machine, will be below the plane of the needle and the operating-lever S^3, and out of the way of the latter in its movements to and fro. A pawl, R′, pivoted to the side of one of the arms of the binder-frame adjacent to the cam-plate *f*, engages one of two pins, *r*, projecting from the face of the plate, and holds the rake shaft H′ against backward rotation during the twisting of the band, and serves to relieve the clutch H^7 of the weight of the gavel when the rake-teeth, lifting the gavel, have reached a horizontal plane.

The shaft T, which operates the band securing device, is journaled on the rear side of the binder-frame and below the binder-table R, and has on its end a pinion, T′, which engages with a segment-lever, *p*, pivoted on the binder-frame, so that it swings in a vertical plane. The lever *p* has an oval ring, *p′*, on its inner end, which is placed around the crank-shaft H^2. This lever is given its motion by a shoulder or pin, p^2, fixed on the inner side of the crank H^3. The ring *p′* has in its outer end a small notch, p^3, into which the shoulder or pin p^2 will enter at the proper moment, and by positive action lift the ring, and thereby depress the segment p^4 of the lever *p*. The segment p^4 rotates the pinion T′ and shaft T at the proper moment for securing the band. The segment-lever *p*, shaft T, and needle S are operated in the proper relative times by the crank H^3. By having the shaft T and needle operated by the single crank no mistakes can occur in the process of securing the band.

K is a head-board hinged to the outer end of the binder-frame, for the purpose of extending the platform B^2 when the grain is long. It also serves as a stop to prevent short and light grain from being thrown off the said platform. When long grain is being cut, the said board is let down to a horizontal position, or to any angle between the vertical and horizontal. With short grain it is set in a vertical position, and stands against the end of the grain-receptacle. It may be of any desired width.

t is a curved wing or apron hinged to the rear end of the divider, so that it will turn outward over the reaper-platform A^2 into line with the divider, as shown in dotted lines in Fig. 1. It is pressed outward into said position by a spring, *t′*, fixed on the divider. It is pressed back by the inner tooth of the sweep-rake E, when it will fill the space between the rear edge or end of the divider and the end of the front board on the binder-frame, thus making a continuous shield from the reaper-frame to the binder-frame. When the rake E has delivered the grain to the intermediate platform, the wing is returned by the spring into the position indicated in dotted lines, in which position it causes the grain cut by the inner end of the sickle to fall back onto the platform at right angles to the sickle.

A further part of the invention consists in a device for discharging the bundle or throwing it off the binder-table after the band is secured. This device is shown attached to the binder in Figs. 1, 3, 5, 9, and 13. It consists in a rock-shaft, L, supported in bearings on the rear side of the binder, and provided with two series of radial fingers, *l* and *l′*, arranged at or nearly at right angles to each other. The bundle while being bound is held between these two series of fingers. The rock-shaft L lies parallel and close to the binder-table R, and the front or lower series of the fingers *l′* extend across and lie in transverse grooves or channels formed in said table. The other series of fingers, *l*, stand in a vertical position, as shown. The end of the rock-shaft L is provided with a crank-arm, which is connected by a pitman, L^2, to the swinging arm *m*. The pitman rocks the shaft about one-third of a revolution, which carries the fingers *l l′* sufficiently far to the rear to drop the bound bundle to the ground. On the needle S is fixed a vertical compressing-arm, S′, rising from near the eye thereof, and so placed that it will push the bundle onto the binder-table and over the twister, and compress it against the vertical

fingers *l* on the rock-shaft L. The two middle fingers of the vertical series *l* are made flexible, so that they will spring back or yield when the bundle is pressed hard against them by the compressing-arm S'. This yielding is necessary to adapt the mechanism to bundles of different sizes. The binder-table might be dispensed with when the discharger is used; but it is preferably used therewith, as better results are obtained. The supporting fingers *l'* could be dispensed with. If not used, the tension of the band will be sufficient in all ordinary cases to hold the bundle in place. The supporting-fingers, however, are preferably used, for by their use all possibility of mistake in binding is prevented, and in case a band breaks the grain will be held together.

The following is a detail statement of the several steps in the operation of binding a bundle. A sufficient quantity of grain having been cut and deposited upon the reaper-platform, it is swept off heads foremost by the sweep-rake E, and by the roller G it is raised and carried over and deposited beyond the rake and butt-board d^3. At this point the rake E strikes the trip-lever a^5, and thereby disengages the arm e^7 from the clutch-pin e^9 of the clutch F'. The spring e^{10} at once throws said pin into engagement with the main shaft F, and the shaft e^3 is thus locked to said shaft F, the crank e^4 is revolved, and the rake d^3, acting against the butts, pushes the grain, heads foremost, into the grain-receptacle B^2, and is at once returned to the receiving end of the platform B'. The clutch-pin then comes in contact with the arm e^7, and the clutch F' is disengaged from the shaft F and the revolution of the crank e^4 is stopped. Just after the rake d^3 begins to return to the receiving end of the platform B' the pins e^6 e^6 on the disk e^5 press down the forward end of the lever i', thus raising the rear end thereof, and thereby disengaging the latter from the clutch-pin f^2 in the clutch H^1, and the crank-shaft H^2 at once becomes engaged with the sprocket-wheel *h* and the needle is withdrawn. At the same time the stop-arm i^2 is raised from the stop-pin f^3 on the cam-plate *f*, and when, by the rotation of the crank-shaft H^2, the notch X corresponds with the pin *f'*, the latter is turned by its spring into engagement with the said notch, and the rake-shaft H' becomes engaged with the sprocket-wheel *h* and the rake H makes one half-revolution, bringing the gavel up against the cord, which extends from the band-securing mechanism to the eye of the needle, which is now moving across toward the binder-table to carry the band under the gavel. This takes place immediately after the sections B^3 B^3 of the grain-receptacle have been raised by the action of the cam-plate *f*. By the rotation of the shaft H^2 and crank H^3 the needle is carried across to the binder-table, carrying the band around the gavel and bringing it alongside of the old end in the band securing mechanism. The segment-lever *p* acts immediately after the needle passes across to the binder-table, and revolves the twister-shaft and secures the band before the needle returns to its first position. The bound bundle is discharged as soon as the crank e^4 begins to revolve to operate the rake d^3 in the operation of carrying a new gavel from the reaper-platform.

Having thus described our invention, what we claim, and desire to secure by Letters Patent, is—

1. In a self-binding harvesting-machine, the combination of a reaper-platform having a side delivery from which the grain is swept heads foremost, an intermediate platform arranged in rear of the main frame and transversely to the line of motion of the machine, and having its receiving end adjacent to the delivery side of the reaper-platform, a reciprocating rake sliding upon the intermediate platform, means, substantially as described, by which the grain as it is swept from the reaper-platform is delivered over said rake onto the intermediate platform, a grain-receptacle or gaveler-platform, arranged at the delivery end of and in the same plane with the intermediate platform, and means, substantially as described, whereby a reciprocating movement is given to the rake over the intermediate platform, substantially as specified.

2. In a self-raking and binding harvester, the reaper-platform, the grain-receptacle, and the intermediate platform, in combination with the rake, a roller journaled upon the rake, means, substantially as described, whereby said roller is caused to revolve while it is at the receiving end of the intermediate platform, and means, substantially as described, whereby said rake is caused to move over the intermediate platform and deliver the grain into the grain-receptacle, substantially as specified.

3. In a self raking and binding harvester, the combination of a rake-carrier, a butt-board or rake secured to the carrier and adapted to push the grain into the grain-receptacle, and a roller journaled upon the carrier in rear of the rake, and adapted to receive the grain from the reaper-platform and deliver it in front of said rake, substantially as specified.

4. The combination, with the intermediate platform, arranged to receive the grain from the reaper-platform, of a rake supported in a suitable frame, a roller also supported in the frame and having a friction-wheel on its end, means for reciprocating said frame, rake, and roller across the intermediate platform, a friction-wheel placed at the receiving end of said platform and arranged to engage the wheel on the roller when said roller is at the receiving end of the intermediate platform, and means whereby motion is imparted to the wheel on the platform, substantially as specified.

5. In an automatic grain-binder, a reciprocating rake, in combination with a swinging rock-shaft for actuating the rake, and means, substantially as described, by which the distance through which said shaft swings is ad-

justed, at the will of the driver, to regulate the throw of the rake, substantially as specified.

6. The combination, with the reciprocating rake, arranged to receive the grain from the reaper-platform and deliver it to the grain-receptacle, of the actuating rock-shaft provided with an arm to connect it to the rake, and journaled near its lower end in a rocking bearing, and having its upper end journaled in a sliding bearing, and means, substantially as described, whereby the distance through which said sliding bearing moves is adjusted, substantially as specified.

7. In a self-binding harvester-machine, the combination, with the grain-platform, the intermediate platform, and the binder-frame, of the main shaft on the binder-frame, the rock-shaft, the actuating mechanism, substantially as described, connecting said shafts, the sliding upper bearing of the rock-shaft, the reciprocating rake, and mechanism, substantially as described, connecting said rake and rock-shaft, whereby the rake is moved across the upper surface of the intermediate platform, substantially as specified.

8. In a harvesting-machine, the combination, with the reciprocating rake and the rock-shaft, of a slotted lever pivoted to the frame, a rod or pitman connecting the rock-shaft with the slotted lever, and the operating-crank engaging the slot in the lever, whereby faster motion is imparted to the rake in one direction than in the other, substantially as described.

9. In a binder attachment for self-raking reapers, the combination of the intermediate platform provided with a longitudinal slot and a protecting-strip covering said slot, the reciprocating rake, the operating-lever below said platform, and the carrier connecting said rake and operating-lever, and placed within the slot, and fitting on the edges of the platform and around the free edge of the covering-strip, substantially as specified.

10. The combination of the intermediate platform provided with a longitudinal slot, a reciprocating rake moving to and fro on the platform, a carrier fixed to the under side of the rake and sliding in the slot in the platform, a sweep-arm connected to the carrier below the platform, a swinging rock-shaft connected to said arm and provided with a crank-arm, a pitman, a slotted lever having one end pivoted to the frame, a crank engaging with the slotted lever, and means, substantially as described, for adjusting the length of swing of the actuating rock-shaft, substantially as specified.

11. The combination of the actuating rock-shaft, held in a pivoted bearing or box near its lower end, and having its upper end held in a box sliding to and fro in a supporting guide-arm, and an adjustable rod held in suitable supports on the binder-frame, and under the control of the driver, whereby the movement of the sliding box may be adjusted at will, substantially as specified.

12. In a self-binder, the combination of a grain-platform for receiving the grain from the reaper-platform, a grain-receptacle having its end close to the grain-platform, and composed of a middle section fixed rigidly in place, and two lateral sections hinged to the middle section, and forming therewith when thrown down a nearly flat platform, and means, substantially as described, whereby the hinged sections may be raised, thereby forming a concave or semi-cylindrical receptacle, substantially as specified.

13. The combination of a grain-platform, a folding grain-receptacle arranged adjacent to said grain-platform and substantially in the same plane with the said grain-platform when open, but semi-cylindrical or concave when closed, a binder-platform extended horizontally from the upper edge of said receptacle, a revolving rake adapted to lift the grain from the receptacle to the level of the binder-platform, a band-carrying needle sliding horizontally over the grain-receptacle, and the operating mechanism, substantially as specified.

14. The combination, with the grain-receptacle having hinged sections provided with lugs on their under sides, of the revolving rake journaled above the grain-receptacle, the cam-plate fixed on the end of and revolving with the shaft of said rake, the rock-shafts pivoted at the sides of the binder-frame and provided with the lever-arms $g\ g'\ g^2\ g^3$, and the rods connecting the arms g^2 and g^3 to the lugs on the hinged sections, substantially as specified.

15. The combination of the main shaft F, the crank-shaft e^3, clutch F′, coupling the ends of said shafts, the lever e^7, trip lever a^5, pivoted on the reaper-platform, spring a^6, connecting-rod e^8, and the rake E, adapted to engage the end of the trip-lever, substantially as specified.

16. The combination of the rake-shaft H′, arranged over the grain-receptacle, the needle S, moving transversely to said shaft and in close proximity thereto, the lever S^3, links S^4 and S^5, crank H^3, crank-shaft H^2, sprocket-wheel h, a double clutch interposed between the ends of the rake-shaft H′ and crank-shaft H^2 and wheel h, and means, substantially as described, for operating said clutches, whereby the proper motion at the proper time is imparted to each of the shafts H′ and H^2, substantially as specified.

17. The combination of the needle S, the shaft T, the crank H^3, and means, substantially as described, connecting said crank to the needle and to the shaft T, respectively, whereby the proper relative movement is imparted to said needle and shaft, substantially as specified.

18. The combination of the rotating rake, the rake-shaft, the crank-shaft, the shaft for actuating the band-securing mechanism, the

needle, a single crank for actuating both the band-securing shaft and the needle, means, substantially as described, for connecting said shaft and said needle to the crank, a clutch interposed between the crank-shaft and the rake-shaft, and the clutch-operating devices, substantially as described, whereby the actions of the needle, the rake, and the band-securing mechanism are properly controlled, substantially as specified.

19. The combination of the reciprocating rake d^3, rotating rake H, rock-shaft n', having arms n and n^5, lever-arm m, pitman m^2, crank e^4, shaft F, rake shaft H′, the interposed clutches, and means, substantially as described, for operating the clutches, whereby intermittent movements are given to the rakes H and d^3, substantially as specified.

20. The combination of the rake shaft H′, having cam-plate f, provided with stops f^3 f^3, the crank-shaft H^2, the interposed clutches or double clutch at H^7, having the clutch-pins, as described, the shaft e^3, the disk e^5, fixed on the shaft e^3, and provided with the radial pins e^6, the lever i, having its forward end resting upon the periphery of the disk e^5 and its rear end arranged to engage a clutch-pin in the clutch H^7, and the stop arm i^2, secured to the lever i and adapted to engage one of the stop-pins f^3, to stop the cam-plate and rake-shaft in the proper positions, substantially as specified.

21. The combination of the shaft F, the shaft e^3, the disk e^5, fixed on the shaft e^3, and provided with radial pins or projections e^6, the sprocket-wheel e^2, revolving with the shaft F, the crank-shaft H^2, which operates the needle and twister or band-securing mechanism, a loose sprocket-wheel, h, revolving on the shaft H^2, the clutch mechanism interposed between the shaft H^2 and the hub of the sprocket-wheel h, and having the clutch-pins, as described, the lever i, having its forward end resting on the periphery of the disk e^5 and its rear end arranged to engage with the clutch-pin, and a chain-belt connecting the sprocket-wheels e^2 and h, substantially as specified.

22. The combination of the binder-table R, the horizontally-moving needle S, the compressor S′, carried by the needle, the rock-shaft L, journaled on the frame parallel with the binder-table, the fingers l l', fixed to said rock-shaft, and means, substantially as described, for operating the rock-shaft and needle, substantially as specified.

23. The combination of the grain-receptacle, semi-cylindrical when closed, the binder-table projected outward from the edge of the grain-receptacle, the revolving rake journaled concentrically with the grain-receptacle, the horizontally-moving needle, and the discharging-fingers l l', secured to a rock-shaft journaled at the outer edge of the binder-table, substantially as specified.

24. The combination of the rock-shaft L, journaled at the outer or rear edge of and parallel with the binder-table, the fingers ll', secured thereto, the pitman L^2, the lever m, having its lower end pivoted to the binder-frame, and provided in its upper portion with a longitudinal slot, the crank e^4, having its wrist-pin working in the slot in the lever m, and the actuating mechanism, substantially as specified.

In testimony whereof we affix our signatures in presence of two witnesses.

ALEXANDER ROSS.
SAMUEL J. PARKER.

Witnesses:
ADELBERT CRONISE,
S. MCK. SMITH.