2 Sheets—Sheet 1.

J. F. EARL.

HARVESTING-MACHINE.

No. 173,454. Patented Feb. 15, 1876.

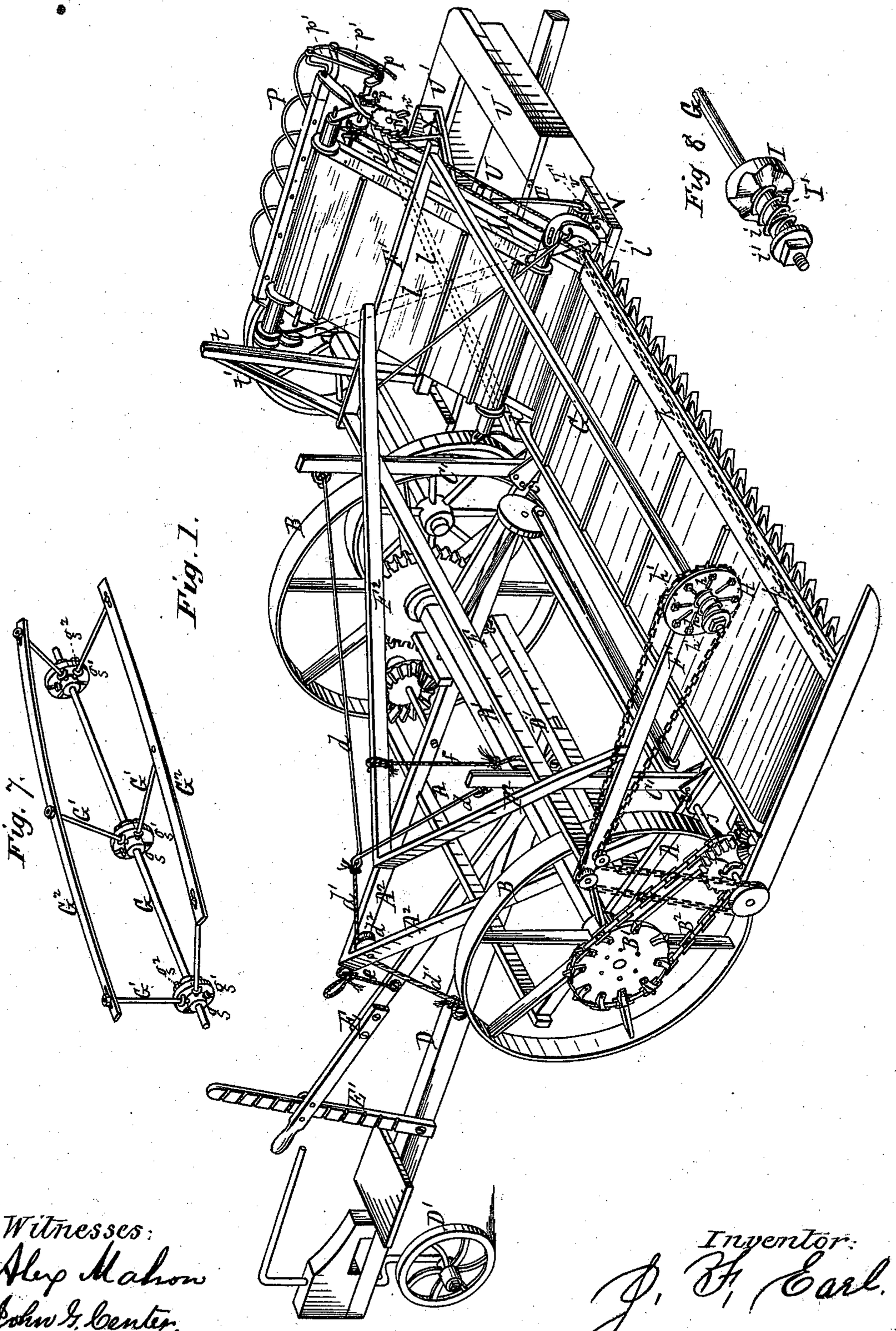

Fig. 1.

Fig. 6.

Fig. 7.

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2 Sheets—Sheet 2.

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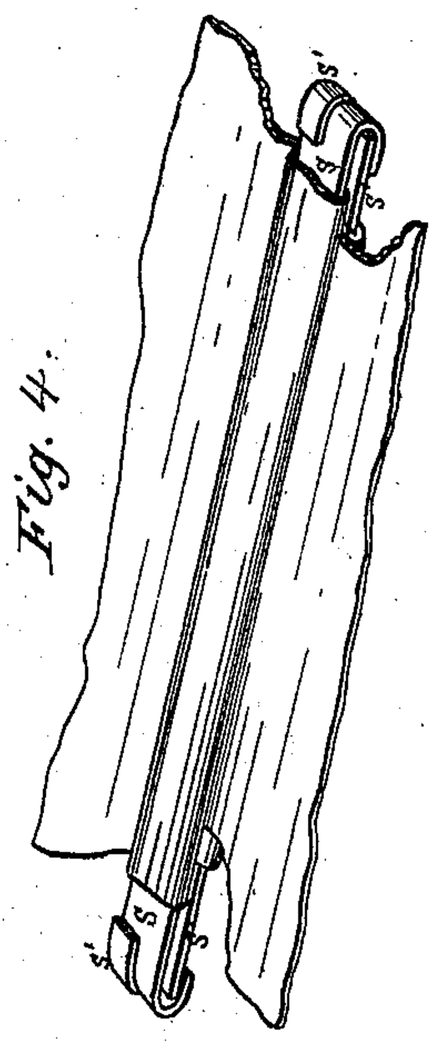

Fig. 4.

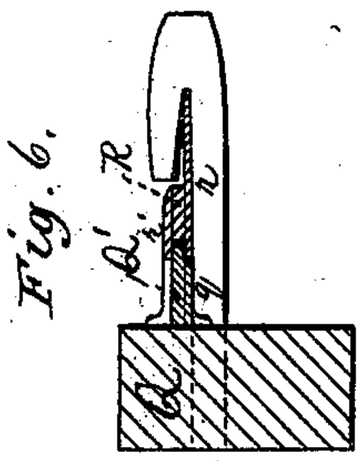

Fig. 6.

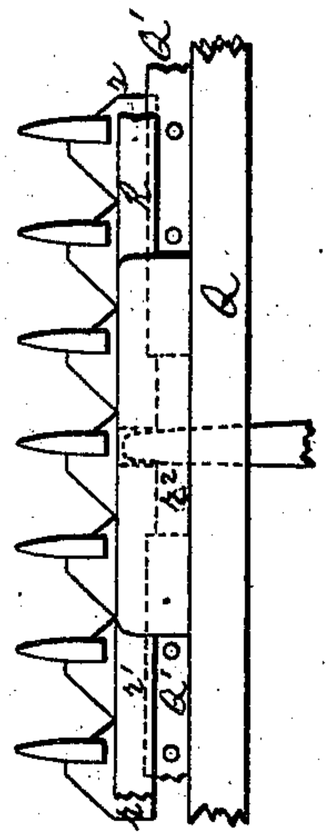

Fig. 5.

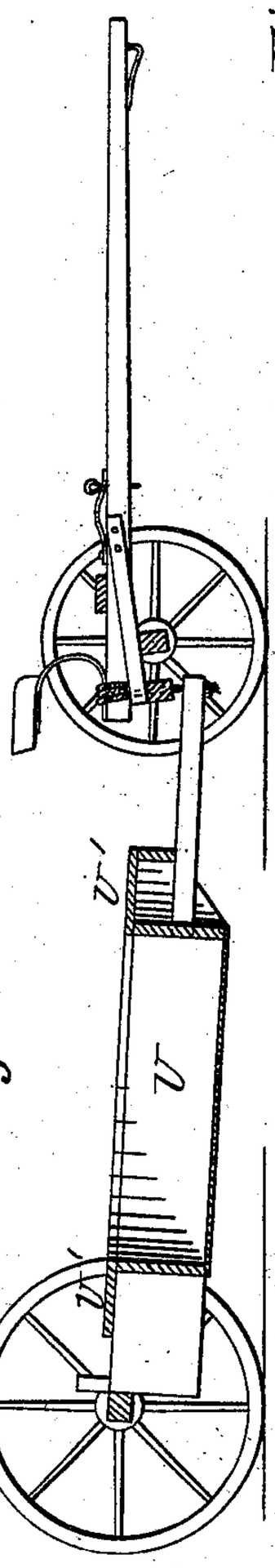

Fig. 3.

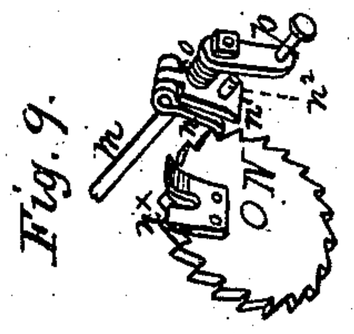

Fig. 9.

Fig. 2.

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UNITED STATES PATENT OFFICE

JAMES F. EARL, OF NEBRASKA CITY, NEBRASKA.

IMPROVEMENT IN HARVESTING-MACHINES.

Specification forming part of Letters Patent No. **173,454**, dated February 15, 1876; application filed August 31, 1875.

To all whom it may concern:

Be it known that I, JAMES F. EARL, of Nebraska City, county of Otoe, State of Nebraska, have invented certain new and useful Improvements in Harvesters, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 represents a perspective view of my improved harvester. Fig. 2 is a front elevation of the elevator and dropper, showing also, in dotted lines, the grain-receiver used when the grain is to be bound by hand before being discharged. Fig. 3 is a longitudinal section through the grain-binders' carriage. Fig. 4 is a perspective view of a section of the carrier-apron, showing the clamp-bars for uniting the ends of and for tightening the apron. Fig. 5 is a plan view of a section of the cutting apparatus, and Fig. 6 is a vertical section through the same. Fig. 7 is a perspective view of a portion of the reel. Fig. 8 is a perspective view of the sliding reel-clutch, and Fig. 9 is a perspective view of a portion of the dropper-actuating devices detached.

Similar letters of reference denote corresponding parts of the machine wherever used.

The invention relates more particularly to that class of harvesters known as the thrust-machine, adapting it to be used either as a header or for cutting the grain full length, in which latter case it may be provided with an automatic dropper for discharging the grain in compact gavels; or the grain may be deposited in a receptacle and bound by hand by binders riding upon an independent carriage provided for them; but it will be evident that several of the features of improvement hereinafter described can be used with equal advantage upon draft-machines.

The invention consists, first, in a novel construction and arrangement of the vibrating main or truck frame, and of the platform and pole or thrust frames connected therewith, whereby the horizontal relation of the platform-frame to the ground is maintained under all adjustments of the cutters, as hereinafter described. It further consists in a novel construction of the reel, adapting the angle of the blades to the cutting apparatus in passing over the same to be varied to suit the condition of the crop; and, further, to the manner of combining the reel-frame with the platform-frame and main frame or axle, whereby the reel is automatically adjusted when the cutting apparatus is raised or lowered, as hereinafter described. The invention further consists in a novel means for uniting the ends of the carrier or elevator apron for facilitating the operation of tightening the same when it becomes slack; also, in a novel arrangement of the chain which drives the elevator, whereby it is made to assist the platform-apron in carrying the butts of the cut grain, as hereinafter described. The invention further relates to a novel construction of the cutting apparatus, whereby the joints between the stationary and moving parts are covered and protected against obstructing matter, as hereinafter described. The invention further relates to a novel means for automatically actuating the dropper and cut-off; and, lastly, to the manner of combining an independent binders' carriage with the machine when it is desired to bind the grain prior to discharging it, all as hereinafter explained.

The machine is primarily designed to be used as a header, but is so organized, as will be explained, that, where it is desirable, or the condition of the crop is such as to render it necessary, the straw may be cut full length, and, being in its general construction and organization similar to other machines in common use, the machine will be described in detail only so far as is necessary to an understanding of my improvements.

The main frame A, made rectangular in form, is secured rigidly to the main axle-bar A^1, between the driving-wheels B B, and to the drooping forward end of this frame the rear end or edge of the platform-frame C is hinged.

The rear end *c* of the platform-frame bars, through which the hinge-connection with the main frame is made, have uprights C′ C′ rigidly secured to them, and to the upper ends of these uprights links *d d* are connected, said links converging to the rear, where they are united to a cord or chain, d^1, which passes over a pulley, d^2, mounted in the rear ends or

angle formed between the converging main-frame brace-extension A^2, from which point the cord or chain d^1 passes downward and is connected adjustably with the pole or thrust bar D, which at its forward end is hinged to the main frame underneath the axle, or about midway of the longitudinal length of the frame A, and at its rear end is supported by a truck or caster and guide-wheel, D^1, of any usual or preferred construction and arrangement.

A lever-bar, E, pivoted at its forward end to the forward end of the thrust-bar D, overhangs said bar, and its rear end, extending within reach of the driver located over the truck D, is held at any desired adjustment by a pivoted rack-standard, E^1, and any usual or preferred form of spring-latching device. A cord or link, *e*, connects this lever at or near midway of its length with the rear end of the brace-extension A^2, thus causing the main frame to move with the lever E. The cord or link *e* can be adjusted in length for varying the relation of the frame A to the lever, thus materially increasing the range of adjustment of the platform. It will be seen that by this arrangement the forward edge of the hinged platform is upheld by the thrust-bar D through the uprights C′ C′, link *d*, and cord or chain d^1, and that as the lever E, together with the rear end of frame A, is depressed for raising the platform and cutting apparatus, the depressing of the roller d^2 causes the deflected cord or chain d^1 to approximate a right line, thus elongating it and permitting the depressing relatively of the forward edge of the platform, which is thus made to maintain its horizontal position in being raised or lowered.

The reel-bearer frame, composed of a rear transverse bar, F, hinged to the uprights C′ C′ and longitudinal arms or bearers F^1 F^1, in the forward ends of which the reel-shaft is mounted, has oblique braces F^2 connected at their forward ends with the arms F^1, and which, converging thence across the bar F, are united at their rear ends, and from said angular brace, at or near its rear end, a link or cord, *f*, extends downward and is united at its lower end with the axle-bar A^1. By this arrangement, when the frame A is rocked, for raising or lowering the platform to suit the varying lengths of grain, a corresponding adjustment is given to the reel, varying in degree corresponding to the relative distance of the points of attachment of the cords *f* and d^1 to the axle and thrust-bar from the centers of vibration of the platform and reel frames. The throw of the reel-supporting frame may be varied by adjusting the point of attachment of the cord or link *f* nearer to or farther from the pivotal center of said frame.

The reel-shaft G (see Fig. 7) is provided with a series of collars, *g*, two, three, or more, connected therewith by set-screws, which permit them to be rotated relatively to each other, and to be secured at any desired adjustment. The collars *g* have disks g^1 formed upon them provided with radial grooves upon one side, forming sockets or semi-bearings for the radial grooves by hook-bolts g^2 passing through the disks and secured by nuts.

The outer ends of the arms G have the beaters G^2 secured to them either by passing directly through slots in said beaters, and being secured by nuts, or bolts may be used, passing through both the arms and the beaters, as shown. By this construction the beaters may be set with either end in advance of the other end, as the condition of the crop may require.

Ordinarily where three disks or collars are used, as shown, it will be necessary only to adjust the end ones. The provision for the partial rotation of the arms G^1 prevents undue strain on the joints of the beaters therewith, while the slots in the beaters accommodate the varying distances between said arms. The sprocket-wheel H on the reel-shaft consists of a disk provided with a series of radial slots, *h*, and the teeth or spurs are formed or cast separately therefrom, and are united to the disk by bolts passing through said slots, and secured by nuts at *h′*, which permit the sprocket-teeth to be moved inward toward or away from the center, thus diminishing or increasing the size of the wheel for increasing or diminishing the speed of the reel, as may be required.

Where the size of the wheel is materially reduced the alternate teeth may be removed, if it should be found desirable, or the construction of the driving-chain should be such as to render it necessary; but it is preferred to use such a form of sprocket-wheel and driving-chain as to render this unnecessary, the change in the speed of the reel being effected by simply adjusting the size of its driving wheel or pulley, as explained.

I, Fig. 8, represents a sliding clutch mounted on the reel-shaft, and provided on one side or face with a number of inclined teeth matching similar teeth on the adjacent face of wheel or pulley H. A sleeve, I′, rigidly connected with the clutch I, and keyed to the shaft G, extends through the wheel H, and a spiral spring, *i*, surrounding said sleeve presses at one end against an adjustable collar, *i′*, and at the other against the disk or wheel H, holding it engaged with the clutch I, and through said clutch with the shaft G, the construction being such as to permit the wheel H to back out of engagement with the reel-shaft in the event of the reel-beaters striking an obstruction which would be liable to injure or break the reel. The measure of resistance to the backing out of the ratchet may be regulated at will by adjusting the collar *i′*.

Motion is imparted to the platform-apron from a driving or sprocket wheel, B′, on the hub of the outer or grain-side drive-wheel B as follows: At the rear outer side of the platform, in suitable bearings arranged in line or

nearly so with the hinge between the platform and main frame, is a short transverse shaft, *j*, which, in consequence of its arrangement, vibrates with the main frame upon a center coincident with the center of rotation of the wheel B^1, thus keeping the driving-chain B^2, which operates a sprocket-wheel on shaft *j*, always under proper working tension. A spur-wheel, J, on the shaft *j* engages with and drives a spur-pinion on a secondary transverse shaft, a bevel-wheel, *j'*, on which engages with and drives a bevel-pinion on the rear end of the outer platform-apron roller, imparting motion to said apron. The forward end of the shaft of this outer platform-apron roller is provided with a grooved or sprocket sheave or pulley, and an endless chain, *k*, passing around said pulley, extends across the platform in front of the carrier-apron and back of the sickle, its upper portion above the finger-bar and over a pulley at the forward end of the lower elevator-roller, and motion is imparted thereby to said roller and to the elevator, while at the same time the arrangement of the chain *k* is such as to cause it to act on the butts of the grain for moving them inward to the elevator. The elevator-frame L is composed of the usual side or front and rear bars, affording bearings for or support to the bearing-brackets for the apron-rollers, and these side bars are connected by two diagonal braces, (shown in dotted lines at *l l*, Fig. 1,) the ends of which extend outside of the side bars at *l'*, and support the bearing brackets or standards, in which the rollers of the upper compressing apron are mounted.

The shaft *m* of the upper elevator-roller M has rigidly secured to it near its forward end an arm or tooth, *n*, which, at each revolution of the roller-shaft, engages with a toothed wheel, N, mounted on a pin or stud on the front of the elevator-frame, said tooth *n* moving the wheel N the distance of one tooth. Outside or in front of the arm or tooth *n* is a second arm, n^1, hinged to and rotating with the arm *n*. The forward end of shaft *m* has a crank-arm, *p*, mounted loosely upon it, and between said arm and the arm n^1 is a spring, *o*, which tends to hold the arm n^1 pressed up closely against the arm or tooth *n*. The arm n^1 is provided with a horizontal pin or spur, n^2, and once at each revolution of the wheel N a wedge-shaped spur, $n^\times$, on its forward face, passes between the tooth *n* and the hinged arm n^1, and, overcoming the tension of the spring *o*, presses the arm n^1 forward until the pin n^2 engages with the crank-arm *p*, and causes it to move through a single revolution for operating the dropper and cut-off, as will be described.

The movement forward of the spur $n^\times$ with the wheel N releases the arm n^1, which is retracted by the spring *o*, releasing the crank-arm *p* until the wheel N completes another revolution.

The dropper P and cut-off P' consist each of a series of curved fingers united to a longitudinal bar or rock-shaft mounted in suitable bearing-brackets at the upper end of the elevator, the fingers of the cut-off being made of a shorter curve, and entering above those of the dropper for the purpose of merely receiving the grain while the dropper is discharging its load, and of then depositing their contents upon the dropper-fingers.

The forward ends of the dropper and cut-off shafts have each a crank, the two being turned in reverse directions, as shown, and both being connected, by links *p'*, with the crank *p*. A movement of the latter moves the dropper and cut-off in opposite directions, the former to discharge its load, and the latter toward the grain discharged by the elevator, for receiving and holding the grain until, by the further revolution of the crank, the movement is reversed and the dropper is returned to its position for taking the grain from the cut-off and elevator.

The carrier-aprons, instead of having their ends laced together or otherwise permanently united, have said ends each fastened to or wrapped around a clamping-bar. *s s'*, Fig. 4, represent these clamping-bars made of a length conforming to the width of the apron or canvas, and of any suitable width.

Just in front, and in rear of the canvas, the bars are cut away for about one-half their width, and the remaining extended portion is bent into hook form, so that when placed together with the hook portions facing in opposite directions the part which has been cut away will pass under the hooks of the opposing bar until, by the tension of the canvas, the hook portions rest against each other, as shown in the drawings. The canvas is wrapped around these bars, passing from each side between them, thus causing the tension of the apron to tend to hold the bars together at their centers; but, if required, clamping hooks or plates may be used for further securing them.

When the canvas becomes loose from use, by simply detaching the clamp-bars from each other, and rotating one or both, an additional wrap is given to the canvas until the desired tension is secured, when the bars are hooked together, as before.

The cutting apparatus has the usual finger and forward platform-bar Q mortised for the reception of the fingers, and for the passage of the sickle-lever, and in front of said bar is a steady-bar, Q', against which the back of the sickle-bar R abuts. The bar rests upon strips or plates *q*, which remove it slightly from the face of the fingers, its forward edge projecting beyond the plates *q*, and the sickle-sections *r* are made to project in rear of the sickle-bar and underneath the projecting forward edge of bar Q', thus covering the line of contact between the rear edge of the sickle and the forward edge of the steady-bar Q', for preventing obstructing matter from getting therein.

The sickle-bar may either have a rabbet

formed on its rear edge, or a plate, r', applied to the side opposite the sickle-sections, said plate overhanging the bar Q′ and covering the joint between the said bar and the sickle-bar.

Where the bar Q′ is cut away for the passage of the sickle-lever, this overhanging plate is extended, as shown at r^2, Fig. 5, and abuts against the bar Q, covering the place thus cut away.

All vertical joints or openings between the moving and fixed portions of the cutting apparatus are thus covered and protected against obstructing matter. The machine, as thus far described, it will be seen, is adapted to be used with the dropper arrangement, in which case the hinged elevator described under this arrangement is supported at its outer end by a caster-wheel, T, running on the ground, and by an upright, t, and link t', connecting it with the main frame, said link being above and parallel with the elevator, and serving to steady its movements, and also to hold the caster-wheel shank in a vertical position. When used as a header, the dropper and cut-off will be removed or turned up out of the way by detaching the links p' p', and an extension of the elevator or a secondary elevator under any usual or preferred arrangement will be added for carrying the heads to and depositing them in a cart or wagon driven at the side of the machine in the proper relation thereto for receiving them. Machines thus constructed may be made to cut a much wider swath than the ordinary harvester, (say, ten feet,) and consequently if any of the ordinary appliances adapting the grain to be bound by hand were employed the machine would become too cumbrous. To remedy this I employ an independent carriage, which may consist of an ordinary farm-wagon, U, provided with raised tables U′, extending either entirely or partly around the wagon-body, as shown in Figs. 1 and 3, and in which any desired number of binders can ride. This wagon is designed to be drawn or propelled by a separate team at the side of the elevator, and may be, to a certain extent, connected therewith, if desired, by providing the wagon on its inner side with a table, V, rigidly attached to it, said table having an outer raised rim or ledge, v. A friction-roller, T^1, at the lower end of a shank, T^2, which is applied in place of the caster-wheel T, rests and moves upon this table, upholding the elevator, or this connection may be dispensed with, and the elevator may be upheld by any usual form of connection with the harvester itself, thus leaving the binders' carriage entirely free therefrom. When thus used the dropper and cut-off are turned up out of the way or removed, and a grain-receiver, X, shown in Fig. 1, and in dotted lines, Fig. 2, is attached to the elevator-frame for receiving the grain, and from which it is removed and bound by men riding upon the carriage U, as explained.

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

1. The platform-frame provided with the uprights C′ C′, and hinged to the vibrating main frame, as described, in combination with the links d d, and cord or chain d^1, arranged and operating in connection with the main frame and thrust-bar, substantially as and for the purpose set forth.

2. The reel-bearer frame F F^1, hinged to the uprights C′ on the hinged-platform frame, and provided with the oblique braces F^2, in combination with the adjustable link or cord f, connecting it with the axle-bar or vibrating main frame, as described.

3. The reel provided with the adjustable hubs or collars g g, grooved disks g' g', rods or arms G^1, and slotted beaters G^2, constructed, arranged, and operating substantially as described.

4. The combination, with the sickle-bar R, of the sickle-sections r, and plate r', overlapping the joint between the sickle-bar and the stationary steady plate or bar Q′, in the manner and for the purpose set forth.

5. The chain k, which drives the elevator, extended across the platform-frame in rear of the cutters, as described, whereby it is made also to assist in removing the grain from the platform, as explained.

6. The clamping-bars s s', applied to the end of the carrying apron or canvas, for uniting said ends and for giving the desired tension to the canvas, as described.

7. The arms n, n^1, and p, applied to the elevator roller-shaft, in combination with the toothed wheel N, and wedge or spur $n^\times$, all arranged and operating as described, for actuating the dropper and cut off.

8. The combination, with the hinged elevator, of the supporting-caster, and the upright t, and parallel links t', arranged and operating substantially as described.

9. The combination of the independent binders' carriage with the hinged elevators by means of the table or platform V, and the supporting-standard W, arranged and operating as described.

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