(No Model.) 2 Sheets—Sheet 1.

D. McPHERSON.

GRAIN BINDER.

No. 521,508. Patented June 19, 1894.

Fig. 1.

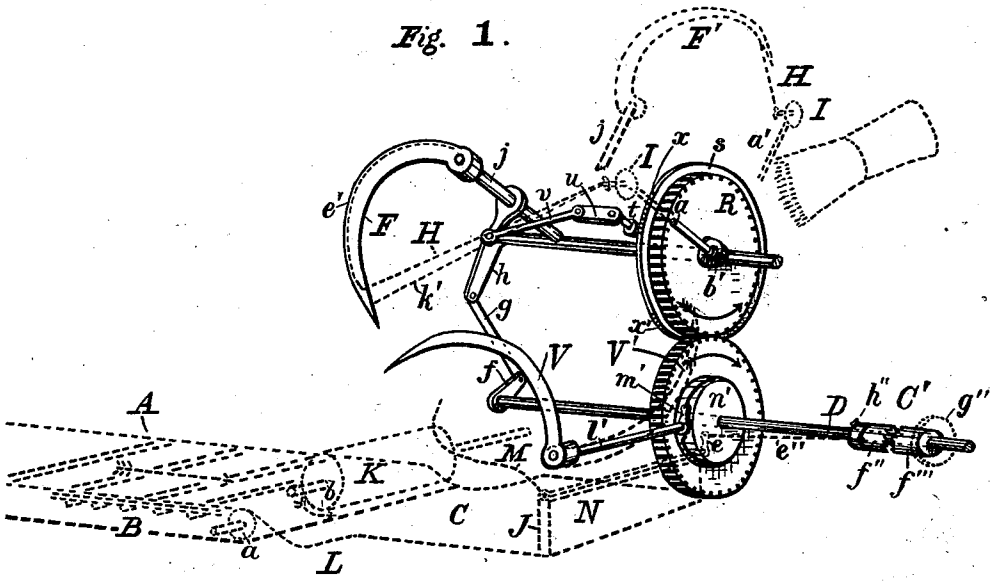
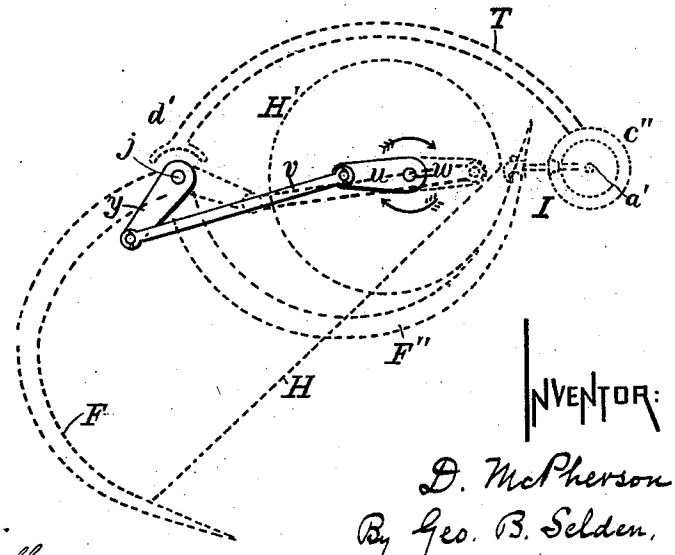


Fig. 2.



WITNESSES:
D. E. Eaton.
C. G. Crannell

INVENTOR:
D. McPherson,
By Geo. B. Selden,
atty.

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

(No Model.) 2 Sheets—Sheet 2.

D. McPHERSON.

GRAIN BINDER.

No. 521,508. Patented June 19, 1894.

Fig. 3.

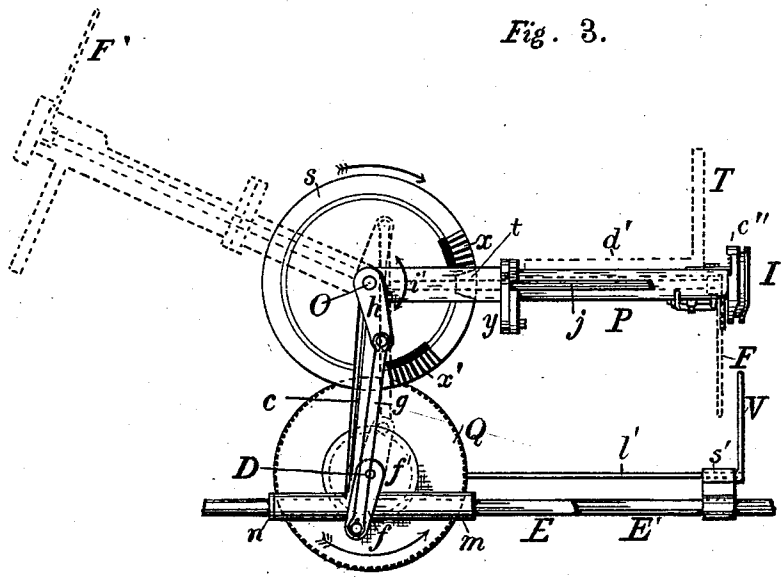


Fig. 4.

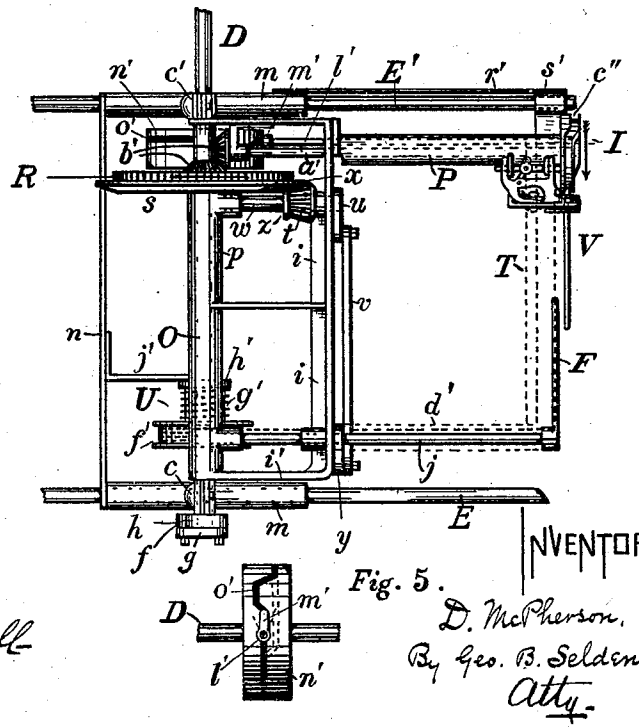


Fig. 5.

WITNESSES
D. E. Eaton
C. G. Crannell

INVENTOR
D. McPherson,
By Geo. B. Selden,
Atty.

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

DANIEL McPHERSON, OF CALEDONIA, NEW YORK.

GRAIN-BINDER.

SPECIFICATION forming part of Letters Patent No. 521,508, dated June 19, 1894.

Application filed February 1, 1894. Serial No. 498,718. (No model.)

To all whom it may concern:

Be it known that I, DANIEL McPHERSON, a citizen of the United States, residing at Caledonia, in the county of Livingston, in the State of New York, have invented certain Improvements in Grain-Binders, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to improvements in the construction of low-down rear-discharge grain-binders, which improvements are fully described and illustrated in the following specification and the accompanying drawings,—the novel features thereof being specified in the claims annexed to the said specification.

In the accompanying drawings representing my improvements in grain-binders,—Figure 1 is a perspective diagram, illustrating the operation of the binder-arm and knotter in grasping the unbound grain on the platform, in elevating it while being bound, and in discharging it in the rear,—representing also the operation of the separator. Fig. 2 represents the mechanism for vibrating the binder-arm. Fig. 3 is a side elevation of the binding mechanism, as seen from the grain side. Fig. 4 is a plan view of the binding mechanism. Fig. 5 represents the cam for operating the separator detached.

My improved binding mechanism is designed to be applied to a harvester of an ordinary type, being located between the driving wheel and the conveyer. The arrangement will be understood by the skilled constructer from Fig. 1, in which A is the conveyer, of any usual or preferred kind, B the sickle, C the binding platform, and D the main driving shaft of the binding mechanism, which revolves once for every bundle bound, being connected with the driving wheel of the harvester by suitable gearing and a clutch in any ordinary or preferred manner.

F is the binding arm, which has an oscillating and a vibrating motion, whereby it is enabled to grasp the unbound grain on the binding platform, to elevate it, to bind it in connection with the oscillating knotter I, and to discharge it in the rear of the machine. The binding arm and the knotter oscillate simultaneously, while the binding arm has also a vibrating movement about its axis, which enables it to grasp the grain, to pass the cord around it, and to discharge the bound bundle.

H is a cord-compressor, extending between the binding arm and the knotter, by which the bundle is compressed while being elevated and bound, and which also facilitates the discharge of the bound bundle.

The knotter is of any usual or preferred type, being supported by a suitable arm so that it oscillates simultaneously with the binder arm. It will be understood that the binder arm and knotter oscillate about an axis located above the rear of the binding platform C, and that the binder arm is located inside or nearer the uncut grain than the bar which carries the oscillating knotter.

The binding mechanism is supported on the rods E E′, Figs. 3 and 4, attached to the frame work of the harvester between the driving wheel and the inner end of the conveyer, so that the binder can be adjusted to adapt it to binding short or long grain in the usual manner.

The cut grain is delivered by the conveyer to the binding table or platform C,—which will be provided with a standard or abutment J, Fig. 1, of any suitable kind to confine the grain thereon. This abutment may be adjustable. A revolving picker or feeder K, Fig. 1, may be employed between the conveyer and the platform, to assist the passage of the grain onto the platform, and in such case a concave L may be formed below the feeder. The platform may be on the same level as the conveyer belt, or a short distance above or below it, as preferred. The feeder may be of any ordinary or preferred type, one of the kinds with folding teeth being best adapted to the purpose. The shaft *b* of the feeder, and also the roller *a* of the conveyer are driven continuously from the driving wheel by suitable gearing and a chain belt at the rear as ordinarily practiced in this class of machines. The mechanism for operating the cutter-bar, and for raising and lowering or tilting the machine, may be of any suitable type.

The binding mechanism is put into operation, and the shaft D made to make one revolution, by a trip-lever M which extends over the platform and is raised against the press-

ure of a spring by the accumulation of grain under it, and which movement is transmitted by the rock-shaft N and a crank *e* to any ordinary or suitable form of clutch on the shaft D, which clutch engages the shaft with the driving gearing of the harvester, so that it makes one revolution, and then automatically disengages the clutch. The rock-shaft N is provided with an arm or crank *e*, which through the connecting rod *e''* slides the movable collar *f''* of the clutch C' outward on the shaft D, so as to engage its outer toothed end with the inner toothed end of the collar *f'''*, which revolves loose on the shaft, being driven by gear *g''* or in any other suitable way, from the driving mechanism of the harvester. The clutch-collar *f''* is splined on the shaft and connected with the rod *e''* by a suitable yoke fitting a groove in the collar. The clutch collar *f''* is provided with an inclined lug or projection *h''*, which comes in contact with a stationary part of the frame-work when the shaft D has made a complete revolution, and disengages the collar *f''* from *f'''* by sliding it inward on the shaft. The spring on the arm M keeps the clutch disengaged, until the arm is raised by the grain accumulated under it, when the spring is compressed, the arm is raised, the collar *f''* is slid into engagement with *f'''*, the shaft D is then rotated, the binding mechanism is actuated, and, when the shaft D has completed a revolution, the collar *f''* is disengaged by the lug *h''* and the shaft D and the binding mechanism remains at rest until, grain sufficient for another bundle has accumulated. Any other suitable means of operating the binding mechanism may be employed.

If the binding mechanism is made adjustable, the gearing should be arranged to transmit motion to it in any position in which it may be set.

The main binding shaft D and the shaft O on which the binder-arm and knotter oscillate, are supported by the standards *c c'*, Figs. 3 and 4, of a suitable frame-work supported by the frame of the machine, or the rods E E'. The standards are provided with suitable journal-boxes for the shafts, and bearings *m* which slide on the rods E E'. The bearings are connected together by suitable bracing, *n*. The oscillating movement of the binder arm and knotter is obtained from the crank *f* on the end of the shaft D, the connection *g*, and the crank *h* on the shaft O, which sustains the frame-work *i*, which supports the binder-arm shaft *j* and the knotter. The crank *h* is made slightly longer than the crank *f*, and consequently when the crank *f* makes a complete revolution, the crank *h*, and the parts connected therewith, oscillate from the position shown by the full lines in Fig. 3 to that indicated by the dotted lines, and then back again. The binding arm is arrested in its motion at a position with its point above the stream of grain, its shaft *j* being then horizontal, as shown in Figs. 3 and 4, or inclined slightly upward, as in Fig. 1. The shaft O is surrounded by a sleeve *p*, which carries the frame *i*, which oscillates with the shaft. In order to secure the vibrating movement of the binder arm on the axis of the shaft *j*, I employ the gears Q R *s t*, crank *u*, and connection *v*. The gear Q is fast on the shaft D, and the gear R runs loose on the shaft O,—the gears R and *s* being attached together. The gear *s* is mutilated, being provided with the two sets of teeth, *x x'*, Fig. 3, each of a length sufficient to give the pinion *t* a half-revolution. The pinion *t* is carried by the shaft *w*, journaled in the sleeve *p* and the frame *i*, and having the crank *u* attached to its outer end. The crank *u* is connected to the crank *y* on the vibrating binder-arm shaft *j* by the connection *v*. The shaft *j* is supported in journals in the sleeve and the frame *i* so that it can rotate axially, but cannot shift lengthwise. A half revolution of the crank *u* will vibrate the binder-arm F from the position indicated at F in Fig. 2, to that indicated by the dotted lines F'',—such movement grasping the grain, encircling it with the cord, and bringing the cord into the proper relation with the knotting-hook. Another half-revolution of the crank will return the binding arm to the position F. The crank *y* is somewhat longer than the crank *u*, so that the former only vibrates with the binder-arm and its shaft, while the latter makes a complete revolution. The double movement imparted to the binder-arm will now be understood. As soon as the shaft D begins to turn, the binder arm is oscillated by the crank *f*, while, at or near the commencement of the oscillation and again at its other end, the binder arm is vibrated by the crank *u*. The gear Q turns the gears R and *s*, and this latter by its mutilated section *x* imparts a half-revolution to the pinion *t*, and this by the shaft *w* and crank *u* causes the binder arm to vibrate toward the knotter, from F to F'', Fig. 2, and the section *x'* causes the binder arm to vibrate in the opposite direction or away from the knotter, when it is at or near the rear end of its path of oscillation, as represented by the dotted lines in Fig. 3. The vibration of the binder arm toward the knotter, encircles the grain with the cord, and its vibration away from it, assists in the discharge of the bound bundle, as indicated in Fig. 1.

It will of course be understood that the relative times of the oscillation and the vibrations can be adjusted by varying the angular positions of the cranks on their shafts, and also the positions of the teeth on the segmental gear. The pinion *t* is provided with delay-shoes, *z*, Fig. 4, of any ordinary construction, arranged to bear against a smooth surface on the gear *s*, to prevent any movement of the pinion except when its teeth are engaged with those of the segmental gear.

The knotter I, which may be of any ordinary or preferred type, is supported by an

arm or sleeve P carried by the frame-work *i*, so that it oscillates simultaneously with the binder arm. On the drawings I have represented an Appleby knotter of a well-known construction applied directly to the sleeve P, such knotter consisting of the ordinary tying-bill, cord-holder, cutter and cord-placing arm, operated by a shaft *a'* extending through the sleeve, but any other suitable arrangement may be adopted. The shaft *a'* is driven from the gear R by the bevels *b'*, and it carries on its outer end the usual knotter-wheel *c''*, provided with a segmental gear for operating the tying-bill, and cams necessary for operating the other parts of the knotter. The binding arm brings the cord around the bundle and into the proper relation with the tying-bill, as indicated in Fig. 2. The knotter acts to tie the knot and sever the cord during its upward oscillation,—and the knotter shaft *a'* remains at rest or nearly so during the return or forward oscillation, since the frame *i* and the parts it carries are then moving in the same direction as the gear *s* and with substantially the same angular velocity. The frame *i* is supported on the shaft O by the arms *i'*.

The outer end of the binder arm shaft and the knotter-support P may be connected together by a suitable bracing, T, preferably arched. The binder-arm-shaft may be sustained from the frame *i* by a suitable sleeve or arm *d'*.

In order to provide for the compression of the bundle, I employ the flexible compressor H, which may consist of a suitable strap or rope, and extends from the knotter to a hole near the point of the binder-arm, and thence along a groove *e'* in the back of the arm, and through suitable eyes on the sleeve *d'* and frame *i* to the spring take-up device U, Fig. 4, which may be arranged in any suitable way to maintain tension on the compressor. In the drawings, the flexible compressor is wound about a drum *f'*, which revolves freely on the shaft D, the spring *g'* being attached at one end to the drum and at the other to a collar *h'* surrounding the shaft. One end of the compressor is secured to the frame work of the knotter in any suitable way, and the other end is fastened to the drum *f'*. When the binding-arm grasps the grain, the drum *f'* turns, against the spring, and the compressor is unwound from the drum, encircling the bundle and causing a suitable amount of compression thereon, as indicated at H', Fig. 2. The collar *h'* does not turn with the shaft, but is supported in any suitable way, such as the arm *j'*. The tension of the spring may be varied, by adjusting the position of the collar *h'*. When the binder-arm vibrates away from the knotter, as indicated at F', Fig. 1, the compressor is drawn in by the spring, and assists in the discharge of the bound bundle. The binding cord, *k'*, Fig. 1, extends from the cord-holder in the knotter to the eye in the point of the binder arm, as usual, and thence through guides to a cord-receptacle supported in any suitable locality on the machine.

The separator consists of a vibrating arm V which reaches over the binding table from its outer edge, and, being depressed at its point at the time the binding-arm grasps the unbound grain, retards the flow of the stream of grain until a complete separation is made, and then swings bodily out of the way, as indicated at V', as the binding-arm elevates the grain. The separator is supported on a shaft *l'*, provided with an arm *m'* operated by a cam *n'* on the shaft D. The cam *n'* is provided with a groove *o'*, Fig. 5, in which a boss or roller on the end of the arm *m'* travels. The cam groove is given the requisite shape to produce the movements of the separator. The point of the separator is normally above the grain, and when the binding arm begins to move, the point is depressed into the grain, and it remains down until the binding arm has fully grasped the grain and begins to elevate it, when the separator is swung bodily upward by the cam, out of the way of the grain as it is raised by the binding arm. The shaft *l'* is supported in any suitable way, as for instance by the arm *s'* connected with the standard *c'* by the rod *r'*. Any other suitable form of separator may be employed.

It will be understood that many modifications may be made in the construction or arrangement of my improved low-down rear-discharge binder, without departure from the principles herein set forth. Thus the shaft D may be operated from an intermediate clutch-shaft making two or more revolutions for each bundle bound, other equivalent mechanism may be substituted for the devices described for either oscillating or vibrating the binder-arm, any suitable type of knotter may be employed, and it may be operated in a manner different from that herein shown, and various other modifications may be introduced while still employing the leading features of my invention, the oscillating and vibrating binder-arm, and the oscillating knotter. In the drawings the shafts *j* and *a'* are shown as parallel with each other, but it is obvious that they might be arranged in different planes, if preferred. The binding platform may be concave, or it may be provided with ribs between which the binding-arm travels. The trip-lever M is swung out of the way as the grain is elevated.

It is obvious that the shafts O and D may be arranged at an angle with the line of feed of the conveyer, instead of parallel thereto, as shown in the accompanying drawings.

I am aware that a machine has been proposed for binding grain and pushing the bundle up and over inclined ways near the side of the platform and such devices are not of my invention. It is characteristic of my improvement that during the binding operation the bundle is lifted free from the plat-

form and carried from below the binding mechanism up, over and to the rear of the same and dropped at the rear of the platform.

I claim—

1. In a grain binder and in combination the binding platform, the binder-arm, the knotter, the frame situated above and pivoted at or near the rear vertical plane of the platform and supporting said arm and knotter above the platform, mechanism to oscillate the frame and simultaneously carry the bundle above said platform and the devices supported thereon and to the rear thereof, and devices for vibrating the arm, all substantially as set forth whereby the bundle can be simultaneously lifted and bound and then discharged from an elevated position on the side opposite that from which it was raised.

2. In a grain binder and in combination, the binding platform, the binder-arm, the knotter, the frame situated above and pivoted at or near the rear vertical plane of the platform and supporting said arm and knotter above the platform, mechanism to oscillate the frame and simultaneously carry the bundle above said platform and the devices supported thereon and to the rear thereof, devices for vibrating the arm, and a spring-held compressor, all substantially as set forth whereby the bundle can be simultaneously lifted and bound and then discharged from an elevated position on the side opposite that from which it was raised.

3. In a grain binder, the combination with the binding platform, of the intermittently revolving driving shaft D arranged at or near the rear of the platform, the shaft O, the frame *i* pivoted thereon, the binder arm supported by the frame, the knotter also supported in the frame, and mechanism operated by the shaft D intermediate the same and the frame and adapted to secure the simultaneous oscillation of the binder arm and knotter, devices to operate the knotter, and devices to vibrate the binder arm to and from the same, the mechanism being all situated above the platform and adapted to simultaneously lift and bind the bundle and subsequently drop it on the side thereof opposite that from which it was raised, substantially as set forth.

4. In a grain binder, the combination with the grain platform, of the intermittently rotating shaft D, the shaft O supported by suitable standards, the frame *i* secured on shaft O and supporting the binder arm and knotter, the gear Q and loose gear R, devices to operate the knotter, mechanism to vibrate the binder arm, and means such as cranks *f*, *h* and link *g* for securing the oscillation of the frame supporting the binder arm and knotter, the mechanism being all situated above the platform and adapted to simultaneously lift and bind the bundle and subsequently drop it on the side thereof opposite that from which it was raised, substantially as set forth.

DANIEL McPHERSON.

Witnesses:
GEO. B. SELDEN,
C. G. CRANNELL.