2. Sheets, Sheet 1.

D. McPherson,
Grain Binder.

No. 107,797. Patented Sept. 27 1870.

Inventor:
D. McPherson
Per W. S. Loughborough & Co
Attys.

Witnesses:
J. K. Hopper.
Geo. P. Parker

Fig 1.

Fig 2

Fig 3

Fig 4.

Fig 5.

Fig 6

Fig 7.

Fig 8.

Travel.

D. McPherson,
Grain Binder.

2 Sheets Sheet 2.

No. 107797. Patented Sept. 27 1870.

Fig 10.

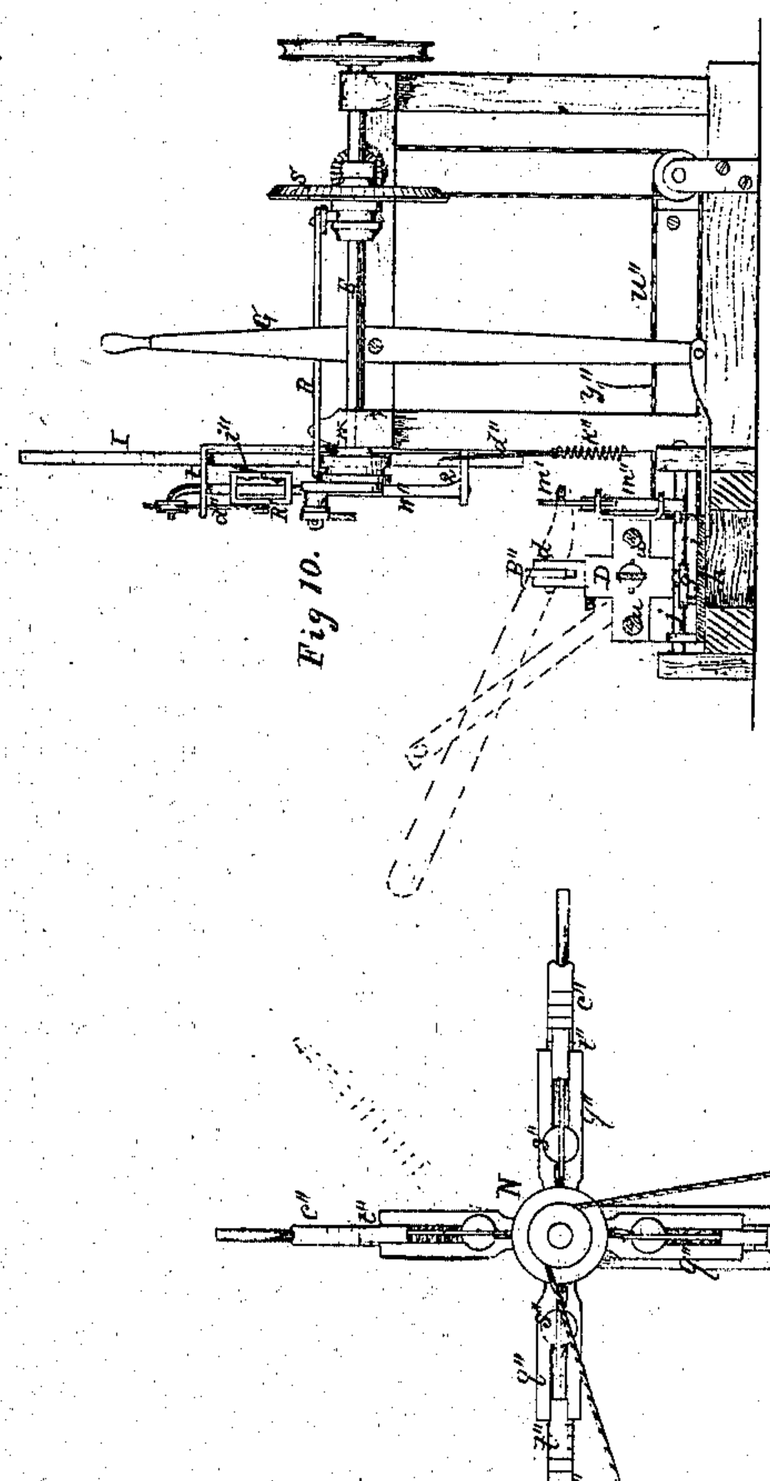

Fig 11.

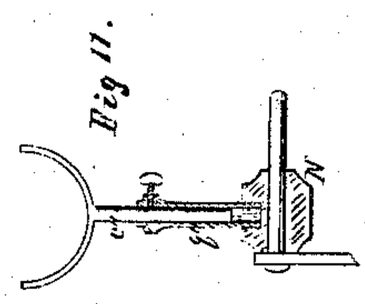

Fig 12.

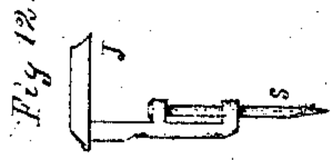

Fig 9.

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UNITED STATES PATENT OFFICE.

DANIEL McPHERSON, OF CALEDONIA, NEW YORK.

IMPROVEMENT IN GRAIN-BINDERS.

Specification forming part of Letters Patent No. **107,797**, dated September 27, 1870.

To all whom it may concern:

Be it known that I, DANIEL MCPHERSON, of Caledonia, in the county of Livingston and State of New York, have invented certain Improvements in Machines for Binding Grain, of which the following is a specification:

My invention relates to a combination of devices for binding grain with wire, and is intended to be applied to an ordinary reaping-machine at the inner end, and to the rear, of the cutter-bar.

In the drawings, Figure 1 represents a plan view of my invention. Fig. 2 is a plan view of the twisting device, shown removed from the frame of the binder. Fig. 3 is an elevation of those parts to the left of the dotted line *x*, Fig. 2. Fig. 4 is a similar view to the right of such dotted line. Fig. 5 is a vertical section at the dotted line *y*, Fig. 2. Figs. 6, 7, 8, 11, and 12 are details. Fig. 9 is a side elevation, and Fig. 10 is an end elevation of my invention to the left of the dotted line *x''*, Fig. 9.

The different parts of my machine are supported upon a frame, A, constructed of any suitable material, and of sufficient size and strength to properly sustain the moving portions. The automatic sweep-rake B, Figs. 1 and 9, which takes the grain from the cutter-bar, is attached to a cross-head, D, moving upon slides *a*. These slides are located at right angles, or nearly so, to the finger-bar of the reaper. (Shown in dotted lines in Fig. 1.) The cross-head D is reciprocated, by means of the crank C, upon the driving-shaft E, and rods *c* and *e*, connected respectively to the upper and lower ends of the vibrating lever *f*, the crank, and the cross-head. The rake-bar B'' is pivoted to a vertical post, *d*, which has bearings in the cross-head D, and is provided, at its lower end, with a crank and wrist, *g*, Figs. 9 and 10. The wrist works in a sinuous slot, *h*, formed in the plate *i*.

It will be seen that as the cross-head is reciprocated by the revolutions of the crank C, the rake B is swung around on the post *d* to the position indicated by dotted lines in Fig. 1, and full lines in Fig. 9, by means of the crank *g* and sinuous slot *h*.

The slides *a* are supported upon a frame, F, which, in turn, moves upon slides *j*, secured to the frame A at right angles, or nearly so, to the slides *a*. A hand-lever, G, Figs. 1 and 10, controls the position of the frame F upon the guides by means of a suitable connecting-link. The object of this arrangement is to so adjust the termination of the sweep of the rake B as that the grain shall be delivered upon the auxiliary platform H in a position to receive the band at the center, whether the straw be long or short. The rake B is pivoted, at or near its center, to the bar B'', Figs. 1 and 9, and the inner end is guided by a projecting tongue of the brace *c'*, which brace is hinged, at its lower end, to the post *d*. The bar B'' passes through a slot in this brace, as shown in section in Fig. 9, and is connected to it by a bolt or pin, *d'*, sliding horizontally in a slot in bar B'', and also in a shorter slot in the brace *c'*. The arm B'' and rake B are supported by the brace *c'*, as shown, and when they are in their lower position, are held down by the latch *e''*, hinged to the post *d*, and hooking over a pin or lug on the brace. When, however, the rake and cross-head are forced back to their rear positions, by means of the crank C and connections, the inclined lower edge of the latch *e''* comes in contact with the tripper *f'''*, fixed to the frame F, which raises the latch and leaves the rake free to rise, while, at the same instant, the latter is elevated by means of the lug *g''*, against which the brace *c'* strikes, causing the rake and bar B'' to rise, as indicated by dotted lines in Fig. 9.

The rake is retained in this position by ratchet-teeth *h''* formed upon the bar B'' and engaging with a hook or pawl fixed to the brace *c'*. While elevated the rake is returned to its forward position and swung around parallel with the cutter-bar, as shown in Fig. 1. This latter operation brings the brace *c'* into contact with the cam-shaped projection *l''*, Figs. 1 and 9, upon the cross-head D, which pushes the brace out of the ratchet-teeth *h'* and allows the rake to fall.

To ease the blow of the rake upon the platform, I provide a spring-latch, *m'*, Figs. 1, 9, and 10, which catches the projecting end 4 of the bar B'' as the rake descends, as indicated by dotted lines in Fig. 10. This latch is pivoted to a post, *m''*, which has a vertical movement in guides fixed to the cross-head D, such movement being controlled by an irregular slot, *n''*, formed in the side of the frame F, into which a lug on the post projects. Just as

the latch m' catches the end of the bar B″, the post m'' begins to rise, by means of the slot n'', allowing the rake to descend gradually upon the platform. When, however, the cross-head D arrives at the forward extremity of its stroke, the projecting arm p'' trips the latch and the rake is left free. It may be desirable to attach a stud, 4, to the end of the rake-head B, working in a slot in the brace c', as shown. This retains the rake in a certain position relatively to the bar B″, and still allows them to rise freely.

For the purpose of collecting and compressing the bundle upon the platform H, I provide the gathering-rake J, the arm k of which is pivoted upon the chain-belt L by a suitable stud. The upper end of the rake-arm is hinged to a link, m, which, in turn, is hinged to a fixed portion of the frame A. The chain-belt L passes over the driving-wheel n and guide-pulleys o and p, the latter of which is located somewhere above the line of the peripheries of n and o, whereby the rake J is elevated clear of the platform H as it returns to the rear. The belt L is operated by shafts q and r, connected to the driving-shaft by suitable gearing. It will be seen that the rake J thus sweeps over the platform H during its forward movement, and is lifted away from it during its return-stroke, the bar k being guided and retained by the link m.

The platform H is curved upward slightly at the forward end, as shown in Fig. 9, so as to be flush with the surface of the cap-plate a' of the twisting device, and, to cause the rake to accommodate itself to this inequality, I make the teeth s separate from the rake-head, and fitted to slide in suitable bearings provided thereon, as shown in Fig. 12.

The wire-bar I, Figs. 1 and 9, the lower end of which is shown also in Figs. 3 and 5, has a vertical movement in guides t, secured to the frame A, and is operated by the segmental gear M, working in a rack upon the face of the bar I, and connected to the crank C by a link, u. The wire drawn from the reel N passes through a slot in the lower end of the bar I, as indicated by the heavy line in Fig. 5, which bar, at each descent, carries the wire, previously pressed around the bundle, to the twisting device.

The adjustment and proportion of the parts which drive the rakes B and J and wire-bar I are such that the rake B delivers the grain from the reaper upon the platform H just as J begins its stroke thereon, and the latter gathers the bundle upon the plate a' just as the wire-bar descends and draws the wire around the bundle. It will, however, be necessary that the movement of the rake J cease for an instant while the wire-bar is descending, and, to accomplish this, the gear S, which drives the belt L, is loose upon the shaft E, and connected to it by a sliding clutch, O, Figs. 1 and 10. This clutch is thrown out for a certain portion of each revolution of the shaft E by means of the revolving cam b' and shifter P. A link, R, one end of which is fitted into a sinuous groove in the periphery of the cam, is pivoted to the shifter P, and said cam is so adjusted upon the shaft E that the clutch is thrown out at the moment that the rake J arrives at its forward position.

Since the cam b' is so formed as to allow the clutch O to pass but one tooth when thrown out, the proportion of the revolution in which the gear S remains still, depends upon the number of teeth in the clutch, and the proportion of the gear to its pinion S′ and chain-belt L must be such that the speed of the rake J shall be accelerated sufficiently through the remaining portion of its movement to return it in time for the descent of the wire-bar, as before.

I attach a collar, b'', Fig. 1, to either of the shafts q or r, provided with a pin or lug projecting from its face or periphery. A spring-bolt, a'', moves in suitable guides upon the frame A, and being beveled off at the outer end from below, it is forced back at each revolution of the shaft by the lug upon b''. As the lug passes, the bolt springs back under it, and the clutch O being thrown out at this juncture, the shafts q and r, belt L, and rake J are thus prevented from being forced back by the pressure of the bundle upon the latter. I do not, however, wish to be confined to the construction or location of the locking device here shown, as other similar arrangements may be used to answer the same purpose. Neither is it essential that the clutch O and connections be attached to the driving-shaft E, since it may be placed upon any of the shafts used to operate the parts.

It is found desirable to use, in connection with the rake J, the auxiliary compression-arm T, which I pivot to the frame of the machine and operate by a slide, R′, Figs. 9 and 10, and cord d'', running over suitable pulleys. The slide R′ moves vertically upon a guide, n'', placed parallel to the wire-bar I, and a spring-latch, i'', Fig. 10, pivoted to the slide, catches under a lug formed upon the wire-bar, by which, as the latter descends, the slide is also carried down. This movement forces the curved arm T down upon the bundle while the wire is being drawn around it by the bar I. As the latter reaches the lower part of its stroke and the wire is caught by the twister, the latch i'' is unlocked from the bar by means of the incline 2 upon the lower end of the guide w'', releasing the slide R′ and arm T, which are returned to their places by the spring k', Fig. 9. The spring k'', attached to the arm T and cord d'', allows the compressor to adapt itself to different-sized bundles.

The twisting apparatus is located immediately under the wire-bar I, and is covered by the cap-plate a', Figs. 5, 7, and 9, upon which the bundle rests during the process of binding. The plate a' is omitted in Figs. 2, 3, 4, and 8, to show the parts underneath.

The lever B′, Figs. 2 and 3, is pivoted to the frame A′ of the twisting apparatus, and is

provided with a slot near its outer end, in which a wrist-pin, upon an arm of the bevel segmental gear C′, works. The segment C′ imparts motion to the twister-head D′ by means of the horizontal shaft *e′* and suitable bevel-gears, as seen in Figs. 4 and 5. The lever B′ has a spur, *f′*, upon its upper edge, of such a length that the wire-bar I passes freely between it and the fixed guide *g′*. As the wire-bar, in its descent, meets and depresses the lever B′, the spur *f′* enters a mortise, *h*, near the end of the bar, shown in dotted lines in Fig. 3, whereby the lever is returned to its place when the wire-bar rises.

A stop, *i*, forced in by a spring, locks under the spur *f′* and prevents the bar B from dropping by the jar of the machine. When the wire-bar descends it pushes out the stop, the inner end of which is beveled off for that purpose.

The twister-head D′ is scroll-shaped, and is provided with the hook *j′* upon one side, which catches the wire carried down by the wire bar as the head begins to revolve. The pivoted jaw *l′*, Figs. 2, 4, and 6, moves in a recess formed in the twister-head, and when swung around by the cam *n′*, as shown by dotted lines in Fig. 6, it clamps the wire tightly against the hook *j′*. A finger upon the cam *n′* comes in contact with the yielding dog *p′*, Figs. 2 and 5, by which the cam is given a part of a revolution for the purpose of clamping the wire. When the wire-bar I rises, lifting the lever B′, the motion of the head D′ is reversed and the finger of the cam is tripped in the opposite direction by the dog *p′* and the jaw *l′* opened to release the wire.

It will be observed that the cam *n′* is located on the opposite side of the twister-head from the hook *j′*, and the position of the dog *p′* being the same with reference to the wire-bar, the wires are clamped at the same instant that they are caught by the hook.

Below the twister D′ I provide cutters *q′ r′*, Fig. 8, *r′* being pivoted to the fixed plate *q′* and operated by the cam-plate *t′*, Figs. 2 and 3, attached to the oscillating lever B′. The hook *w′*, pivoted to a portion of the frame A, gathers the wire between the cutters and into the jaws of the twister just as the latter closes, and the cam *t′* is so arranged as to operate the knife *r′* at about the same time, whereby the twister is left free to revolve with the ends of the wire firmly clamped in it.

The gathering-hook *u′* is worked by the wire-bar, which acts in its descent on the inclined face of the slide *v′*, Fig. 3, and forces it outward, carrying with it bent arm *w′*, which is suitably attached to the hook. A spring returns the slide and hook to their original position, and another opens the jaw *r′*.

It will be seen by reference to Fig. 3 that the end of the lever B′ and lower edge of the fixed guide *g′* form a clamp for the lower end of the wire while the bundle is being formed, the wire taking the direction shown in Figs. 3 and 5. After the wire is cut off, that part projecting from the lower end of the wire-bar is left bent up close to the bar, as indicated by heavy and dotted lines in Fig. 5. For the purpose of straightening this end, I provide the oscillating stripper-arm *x′*, Figs. 3 and 5, having a sharp or rounded lower edge. This arm has bearings in the frame A′, and its lower edge is retained against the face of the wire-bar by a spring, and it is so located that the bent end of the wire passes it when the bar I descends, but when the latter ascends the wire is bent down so as to be caught by the clamp B′ *g′* and securely held.

The reel N has a bearing upon a post, N′, at a sufficient distance above the frame A, and to its arms *q″* are pivoted the adjustable arms *c″* carrying Ys at their outer extremity to receive the coil of wire. The arms *c″* fold over, as indicated by dotted lines in Fig. 9, whereby the coil may be placed upon them without winding off. The pivots *s″* slide in slots formed in the arms *q″*, and the inner faces of *c″* are provided with ratchet-teeth, in which the spring-pawls *t″* engage. The reel may thus be adjusted to a coil of wire of any diameter. It may be desirable to use the arrangement of arms shown in Fig. 11, in which the arms *c″* slide in the tubular arm *q″*, the adjustment being secured by a set-screw, as shown.

If convenient, the arms *c″* may fold in a direction at right angles to that shown.

The chain *u″*, Figs. 1 and 10, worked by a chain or gear from the shaft E and moving parallel, or nearly so, with the frame A′, is provided with a spur, *y″*, which, being properly timed, sweeps the bundle off at the side of the machine as soon as bound. An opening, 3, is provided in the cap-plate *a′*, which admits the wire-bar easily, and a conical cavity or countersink is formed around it, upon the upper side of the plate, whereby the bar, if forced to one side by the pressure of the bundle, is guided into the opening 3. A slot is also formed in this plate extending to the center of the twister-head, which allows the wire to be drawn to such center to be twisted.

The operation of my invention is as follows: Power being communicated from the ground-wheel of the reaper to the shaft E, the rake B drops into the grain upon the platform and carries it around to the auxiliary platform H, when the rake is raised by the action of the lug *g″* upon the brace *c′*. Just as the grain is delivered upon the platform H, the rake J drops upon the latter and gathers the bundle upon the cap-plate *a′*, while the wire, which has been previously put through the slot in the end of the bar I and clamped in the pinchers B′ *g′*, is thus pushed forward and lies partly around the bundle.

At this juncture the wire-bar I and compressor T begin to descend, and the cam *b′* throws out the clutch O, allowing the motion of J to cease till the wire-bar enters the opening 3 in the cap-plate. The wire is thus drawn entirely around the bundle, as indicated in Fig. 5, and as the bar I passes through the

opening in the cap-plate, the latch y' is pressed against the wire, and by its friction checks the latter and controls its tension around the bundle. The double wire is next caught by the gathering-hook u' and pushed into the cutting-jaws q' r' and also l' j' of the twister, which latter, at its first quarter-revolution, clamps the ends of the wire just before they are cut off. The head D′ then makes two or more turns, by means of the lever B′ and segment C′, securely twisting the wire together. Meanwhile the bar I ascends, reversing the motion of D′ and releasing the band, while the end projecting from the wire-bar is turned down by the stripper x' and caught in the clamp B′ g', ready for the next bundle.

The spur y'' now pushes the bundle off upon the ground, and the rakes B and J complete their movements and return, as before.

It will be observed that all the parts of the twisting device are operated by the descent of the wire-bar. By this arrangement I dispense with the apparatus necessary to operate these parts from the drive-shaft, and insure their movement in exact time with the wire-bar. It may be found preferable to attach the segment C′ directly to the lever B′, thus dispensing with its two bearings.

In place of the chain w'' and spur y'', I may use a bent arm operated in the proper time by some moving part of the machine, and if desirable the compression-rake J may be worked by a lever or crank instead of the belt L.

What I claim as my invention is—

1. The cross-head D and guides a, in combination with the sweep-rake B, substantially as and for the purposes shown and described.

2. The plate i, having the sinuous slot h, in combination with the crank g and reciprocating cross-head D, the parts being arranged to operate substantially as and for the purposes set forth.

3. The sweep-rake B, in combination with the wire-bar I, operated conjointly by the crank C, segmental gear M, connecting-rods e, c, and u, and walking-beam or bell-crank lever f, substantially as shown and described.

4. The hinged retaining-latch e'', in combination with the brace c' and post d, for the purposes set forth.

5. In combination with the above, the stationary tripper f'', as and for the purposes set forth.

6. The pivoted rake-bar B″, provided with the ratchet-teeth h'', in combination with the brace c', arranged to operate substantially as described.

7. In combination with the hinged brace c' and rake-bar B″, the elevating-lug g'', for the purposes specified.

8. The spring-latch m', having its vertical movement controlled by an irregular slot, n'', in combination with the pivoted rake-bar B″, operating substantially as set forth.

9. In combination with the latch m', the tripping-dog p'', for the purposes set forth.

10. The wire-bar I, constructed and operating as described, in combination with the segmental gear M, crank C, and connecting-rod u, operating substantially as described.

11. The combination of the compressing-arm T, wire-bar I, and rake J, arranged and operating substantially as set forth.

12. The slide R′ and spring k' on the compressing-arm T, in combination with the operating cord or chain d'' and spring k'', for the purposes set forth.

13. The spring-latch i'', on the slide R′, in combination with the incline 2 on the guide w'', for the purposes set forth.

14. The reciprocating wire-bar I, arranged to operate the twisting devices, substantially as described.

15. The friction-latch y', at the lower end of the wire-bar I, operating substantially as described.

16. In combination with the reciprocating wire-bar I, the oscillating lever B′, provided with the spur f', arranged to operate substantially as described.

17. The lever B′, in combination with the guide g', when arranged to act as a clamp for the wire, substantially as set forth.

18. The segmental gear C′, in combination with the lever B′, for operating the twister D′, substantially as described.

19. The pivoted clamping-jaw l' and cam n', in combination with the hook j' upon the twister, for the purposes set forth.

20. The yielding tripping-dog p', in combination with the cam n', arranged to operate substantially as described.

21. The gathering-hook u', in combination with the twister D′ and cutter q' and r', for the purposes set forth.

22. The sheaf-discharger, composed of the revolving chain-belt u'', provided with one or more spurs y'', arranged to operate as and for the purposes set forth.

23. The combination of the wire-bar I, slide v', bent arm w', and gathering-hook u', substantially as herein set forth.

24. The automatic rocking stripper x', in combination with the reciprocating wire-bar I, for the purposes set forth.

25. The pivoted cutter or knife r', operated by the oscillating cam-plate t', substantially as and for the purposes set forth.

26. The lever G, in combination with the sliding base-plate i' of the sweep-rake B, for the purposes set forth.

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