3 Sheets—Sheet 1.

S. MILLER.

GRAIN-BINDER.

No. 186,056. Patented Jan. 9, 1877.

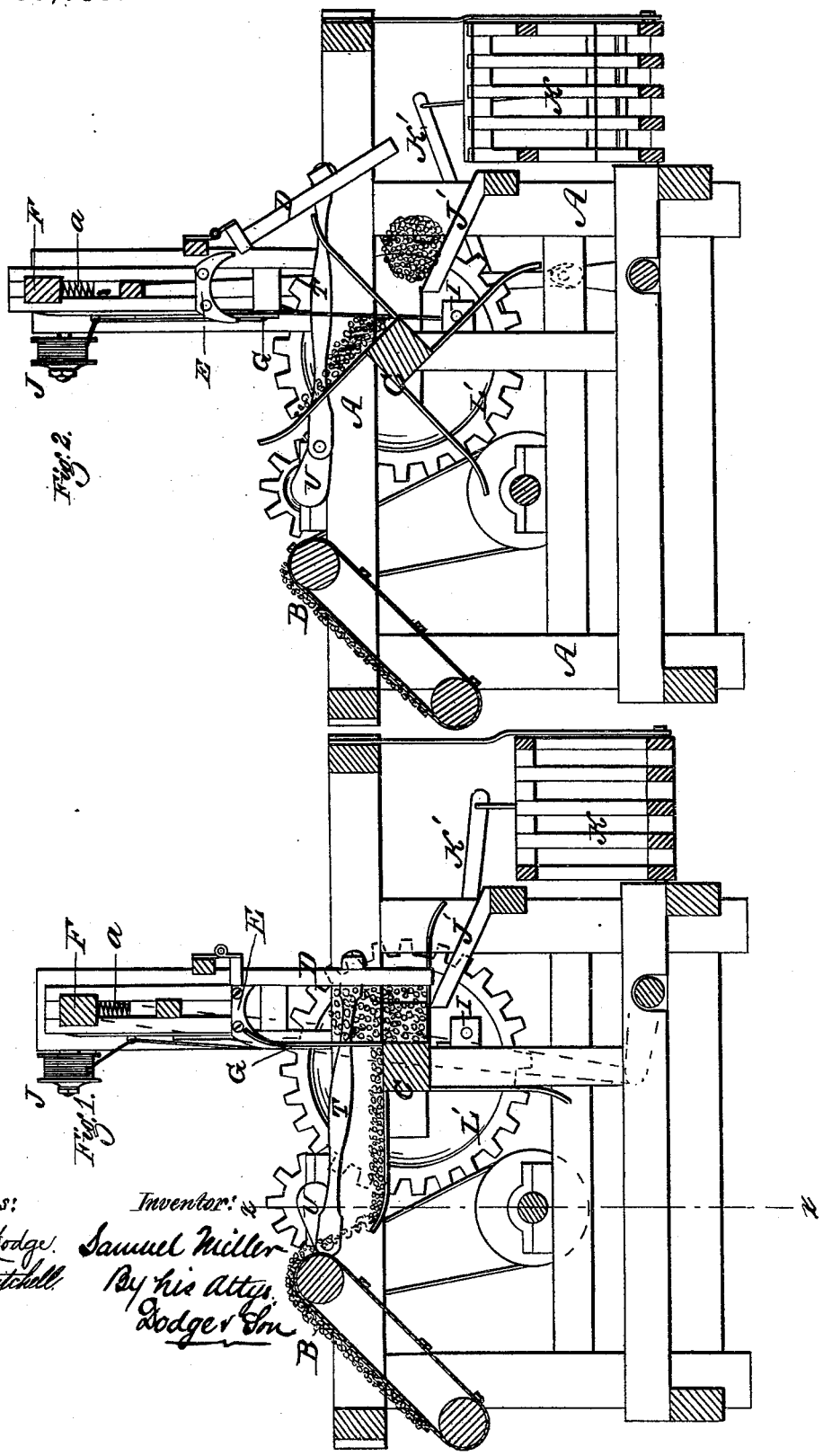

Fig. 2.

Fig. 1.

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Fig. 3.

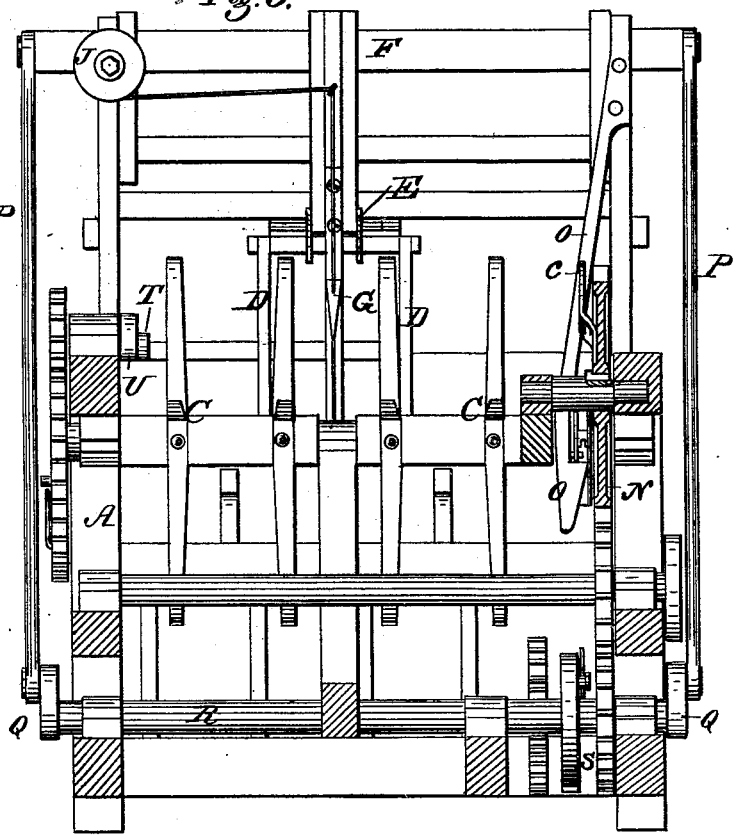
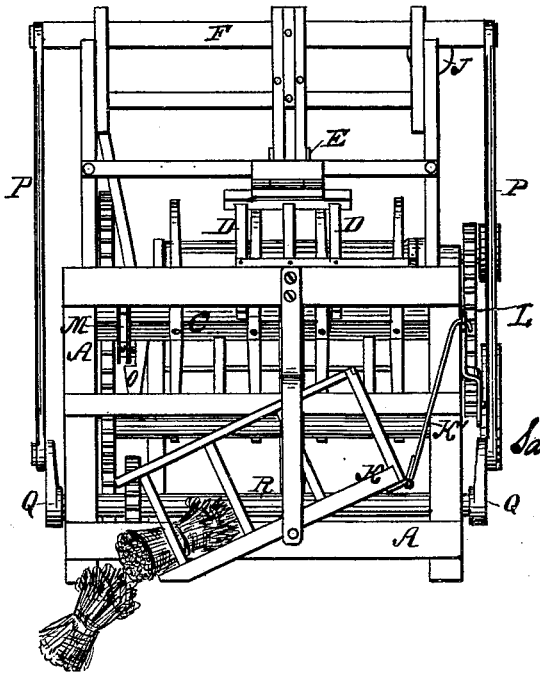


Fig. 4.



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3 Sheets—Sheet 3.

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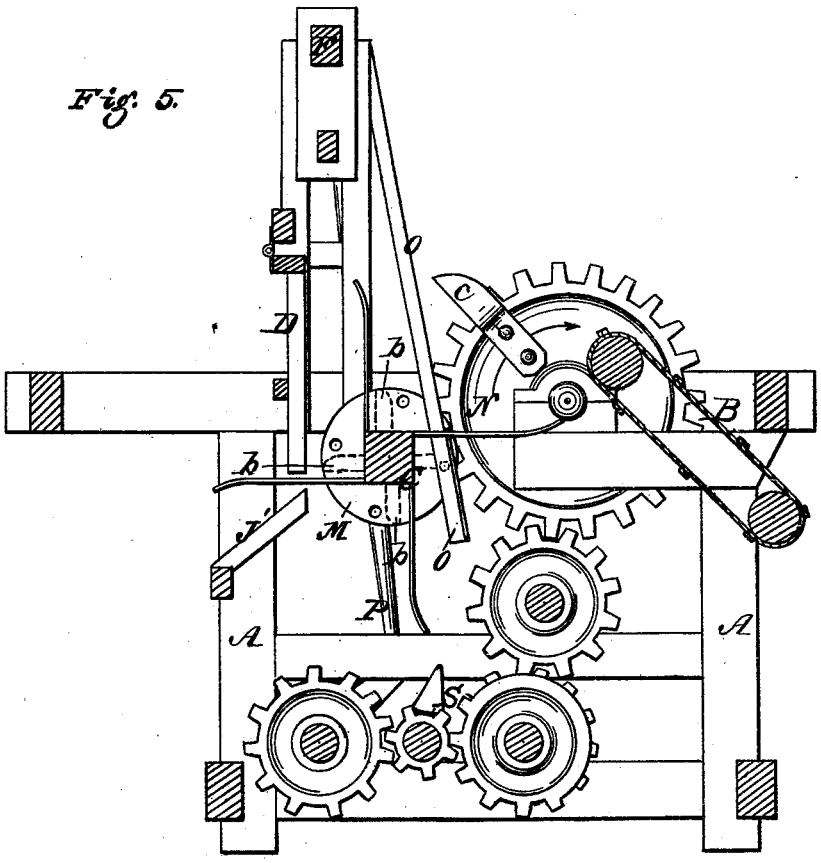
Fig. 5.



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UNITED STATES PATENT OFFICE.

SAMUEL MILLER, OF LAMOILLE, IOWA.

IMPROVEMENT IN GRAIN-BINDERS.

Specification forming part of Letters Patent No. **186,056**, dated January 9, 1877; application filed July 19, 1876.

To all whom it may concern:

Be it known that I, SAMUEL MILLER, of Lamoille, in the county of Marshall and State of Iowa, have invented certain Improvements in Grain-Binding Machines, of which the following is a specification:

My invention relates to a novel construction and combination of mechanism for receiving the grain, dividing and compressing the same into bundles, encircling the bundles with the binding cord or wire, and, finally, delivering the bound bundles from the machine.

The invention consists in the combination and arrangement of a rotary receiver and carrier; a swinging support for the grain; a vertically-moving wire or cord carrier; and a fixed knotting or twisting device; and, also, in a special arrangement of mechanism for operating the binding devices and for discharging the bound bundles from the machine at regular intervals.

Figure 1 represents a longitudinal vertical section through the center of my binding apparatus, with the parts in the positions which they occupy just previous to the commencement of the compressing and binding operation; Fig. 2, a similar view with the mechanism shown in the act of discharging the bound bundle; Fig. 3, a vertical cross-section of the machine on the line *x x*. Fig. 4 is an outside or end elevation of the machine, showing the tilting-crate and its operating mechanism, by which the bound bundles are delivered from the machine at regular intervals; Fig. 5, a longitudinal section of the machine, showing the mechanism for rotating and locking the rotary receiver.

A represents the main frame of the apparatus, and B an endless apron, conveying the grain from the cutting to the binding mechanism. C represents my rotary receiver, consisting of a transverse shaft, provided with four radial sets of arms, standing at right angles to each other. As shown in the drawing, the receiver is so located that its rear arms receive the grain falling from the endless apron. By means of mechanism hereinafter described, the receiver is turned forward at regular intervals one-fourth of a revolution at a time, so that as soon as a sufficient amount of grain has accumulated on the rear arms to form a bundle they carry it forward, and the next set of arms rise in their place to receive the grain from the belt, the receiver, with its intermittent movement, thus serving to divide the continuous stream of grain falling from the apron and carry the same forward in small quantities, each sufficient to form a single bundle or sheaf. D represents the hinged support, hung in a vertical position behind the shaft of the receiver, as shown, so that, as the arms of the receiver on which the grain rests turn forward and assume a vertical position, they carry the grain against the support D, which sustains the same on the rear side, while the preceding arms, which have in the meantime turned down to a horizontal position, sustain the grain from below. Thus, it will be seen, the grain is supported on the rear horizontal arms of the receiver and held between the upright arms of the same and the support D, as shown in Fig. 1. It will also be seen that each set of arms of the receiver serves two purposes—first, that of receiving and dividing the grain forward, and, second, that of sustaining the grain received by the next set of arms as they are turned forward. E represents a vertically-sliding compressor, arranged to descend upon the grain while the latter is held between the receiver and the support, for the purpose of reducing the grain to a compact regular shape.

In order that the compressor may bear on the grain with a yielding pressure, it is mounted on and carried by a cross-head, F, in such manner that it is free to slide vertically thereon, and a spiral spring, *a*, inserted, as shown in Figs. 1 and 2, so that while it tends to force the compressor downward it permits the same to yield and rise independently of the cross-head whenever it meets with an unusual resistance—as, for example, when the bundle of grain happens to be of larger size than usual.

G represents the vertically-reciprocating cord-carrier, secured to the cross-head F, and extending down in front of the compressor. It consists simply of an arm, the end of which

will be provided with a head adapted to carry the end of the binding-cord, present the same to the tying or knotting devices, and then grasp the new end, formed by severing the cord, to release the bound bundle. I represents the knotting or tying device secured to the frame below the rotary receiver.

The cord-carrying head and the tying device form no part of my invention, and may be constructed on either of the various well-known plans now in common use.

J represents a spool or reel, mounted on the side of the frame to carry the binding cord or wire. This spool may be constructed in any suitable manner, and located at any point which will admit of the cord being readily carried therefrom to the carrier G.

The operation of the machine is as follows: The binding-cord is passed from the spool to the carrier G, and thence down to the knotting device I, by which the end is held. The grain from the endless apron falls upon the rear arms of the rotary receiver C until a sufficient quantity has accumulated to form a bundle, whereupon the receiver is turned forward a quarter of a revolution, and the grain thereby carried against the wire or twine, and back against the support D, the wire or twine being thereby caused to draw partly around the bundle. The compressor E next descends and reduces the grain to a compact regular bundle, and, at the same time, the carrier G passes the cord down on the front side of the bundle to the knotting device I, thereby completely encircling or binding the bundle. The knotting device I unites the cord firmly, and severs the same so as to release the bundle, at the same time retaining the new end produced by the severance. The support D next swings backward out of the way, and the receiver C, turning forward, discharges the bound bundle, and, at the same time, brings forward on the next set of arms the grain to form another bundle, as shown in Fig. 2, the support swinging back immediately to its first position to sustain the new bundle. Prior, however, to the rotation of the receiver the compressor and the cord-carrier rise so as to be out of the way, and to extend the cord behind the advancing grain, as before.

Below and behind the binding devices I locate an incline, J′, to receive the bound bundles, and at the foot of this incline I arrange a pivoted tilting-crate, K, to receive the bundles from the incline. This crate is so arranged to remain at rest until a fixed number of bundles have accumulated therein, when it tips endwise and discharges them upon the ground. This tipping of the crate may be effected by any suitable mechanism; but it is preferred as shown in the drawing, to connect it at one end with a lever, K′, which is acted upon by a pin secured to a wheel, L, on the shaft of the rotary receiver C. When thus arranged the crate receives and discharges four bundles at a time. The binding mechanism may be actuated in any suitable manner or by any suitable driving mechanism, but the arrangement represented in the drawings is considered the best.

As shown in Figs. 3 and 5, the rotary receiver C has its shaft provided with a wheel, M, having four equidistant ribs or studs, *b*, which are acted upon by an arm, *c*, attached to a continuously-revolving wheel, N. At each revolution of the wheel N its arm *c* comes in contact with one of the studs *b*, and turns the wheel M and receiver C the required one-fourth of a revolution, when the arm passes the stud and allows the parts to stop. The receiver is locked in position during the compressing and binding operations by means of a spring-arm, O, which is provided on one side with a stud to enter holes made for the purpose in the side of the wheel M. The unlocking of the receiver is effected by providing the lower end of the locking-arm O with an inclined face on one side, in the path of the arm *c* of wheel N, by which the receiver is turned, so that before said arm tends to turn the receiver it rides against the inclined face of the arm O, and thereby unlocks the same from the wheel M. The movement of the cross-head E, to which the cord-carrier and compressor are attached, is effected by mounting its ends in vertical guides and connecting them to the upper ends of pitmen P, which are connected at their lower ends to cranks Q, on the ends of a transverse shaft, R, which receives motion through a train of intermediate pinions from the wheel N. In order to secure the required intermittent motion of the crank-shaft R, a stop-motion gear, S, of ordinary construction, is introduced into the train between the shaft and the continuously-revolving wheel N.

The swinging movement of the hinged support D is produced by means of a pitman, T, connecting with a crank, U, the shaft of which is provided with a pinion gearing into the wheel L on the shaft of the rotary receiver, so that the movements of the receiver and the support take place simultaneously.

Having thus described my invention, what I claim is—

1. The combination of a rotary receiver, C, a hinged support, D, and a vertically-moving compressor, E, substantially as shown.

2. In a grain-binding machine, the combination of a fixed knotting or twisting device, I, a vertically-reciprocating wire or cord carrier, G, and a rotary-armed receiver, C, constructed and arranged to divide the grain and deliver the same against the wire in position to be bound.

3. In a grain-binding machine, the combination of the rotary receiver and carrier C, hinged support D, and incline J′, with the crate or receiver K, the lever for tilting the

same, and the wheel L′, provided with the pin for actuating the lever, as described and shown, whereby the bound bundles are delivered automatically from the machine at regular intervals.

4. The combination of the rotary receiver C, provided with the wheel M, having the studs *b*, the beveled locking-arm *o*, and the rotary arm *c*, arranged to release the locking-arm and turn the receiver, as described and shown.

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