3 Sheets—Sheet 1.

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Grain-Binder.

No. 223,773. Patented Jan. 20, 1880.

Fig. 3

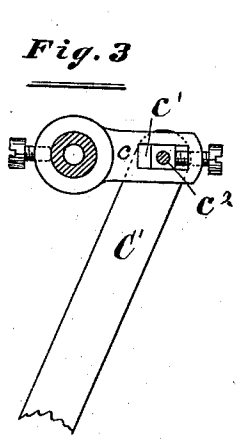
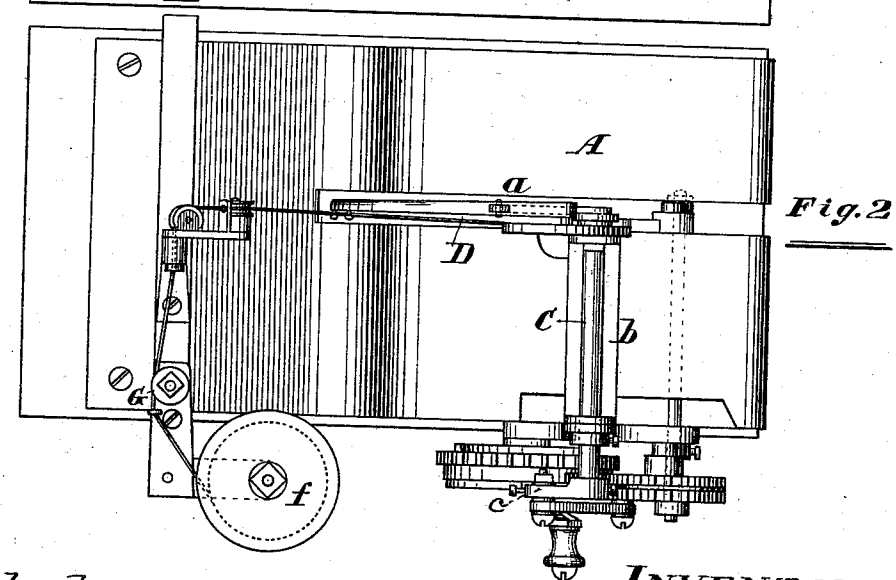


Fig. 1

Fig. 2



Attest:

Wm. F. Baker

Jno. C. Macgregor.

INVENTOR:

Daniel Strunk

By Coburn & Thacher

Attorneys.

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

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D. STRUNK.

Grain-Binder.

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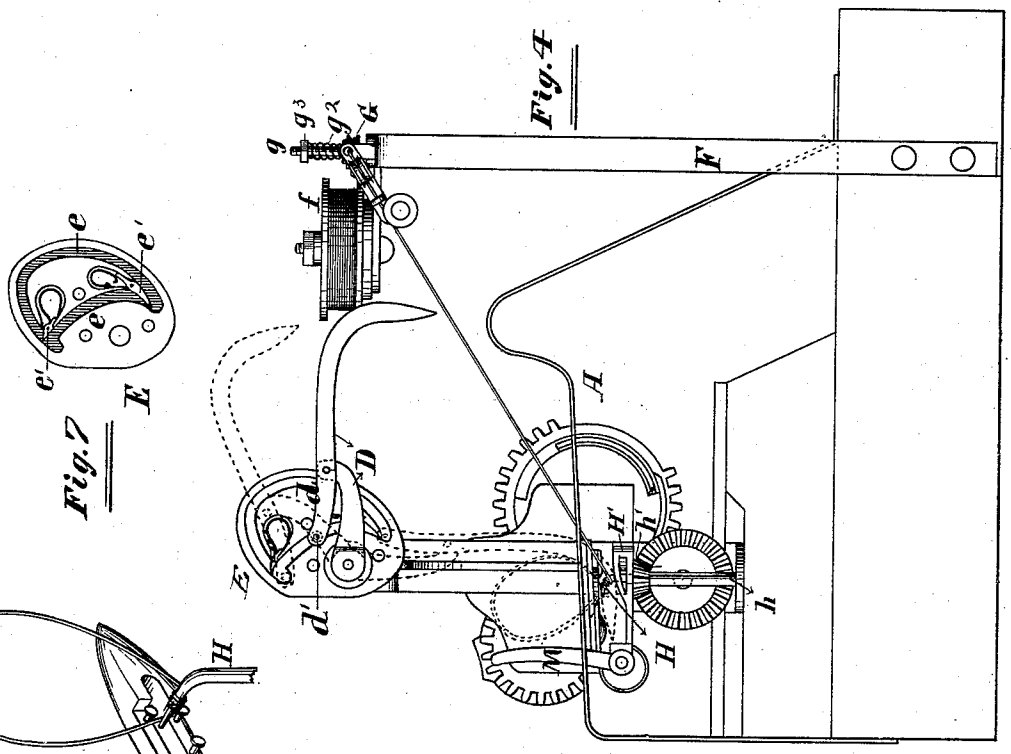


Fig. 7

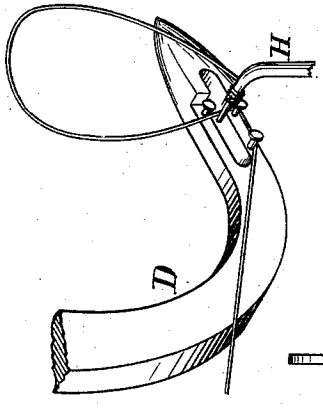


Fig. 6

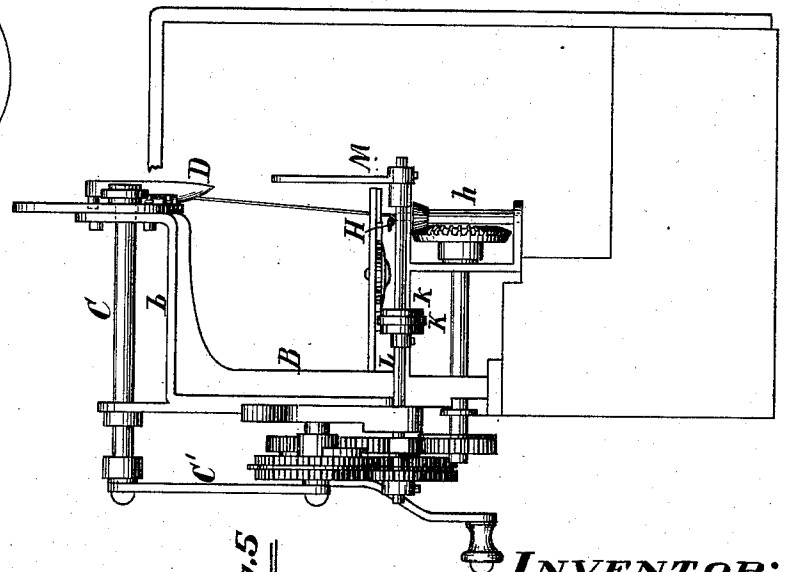


Fig. 5

Attest:

W^m. L. Baker.

Jno. C. Macgregor

INVENTOR:

Daniel Strunk

By Johnson & Dachus

Attorneys.

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

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D. STRUNK.

Grain-Binder.

No. 223,773. Patented Jan. 20, 1880.

Fig. 8

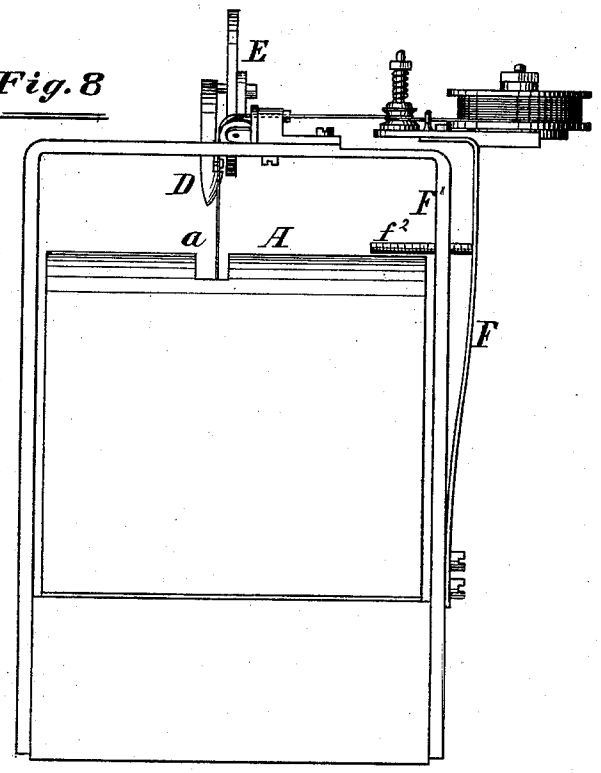


Fig. 9

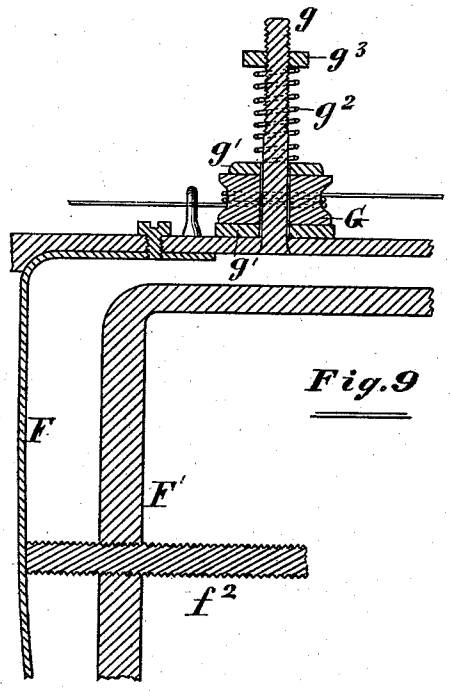


Fig. 10

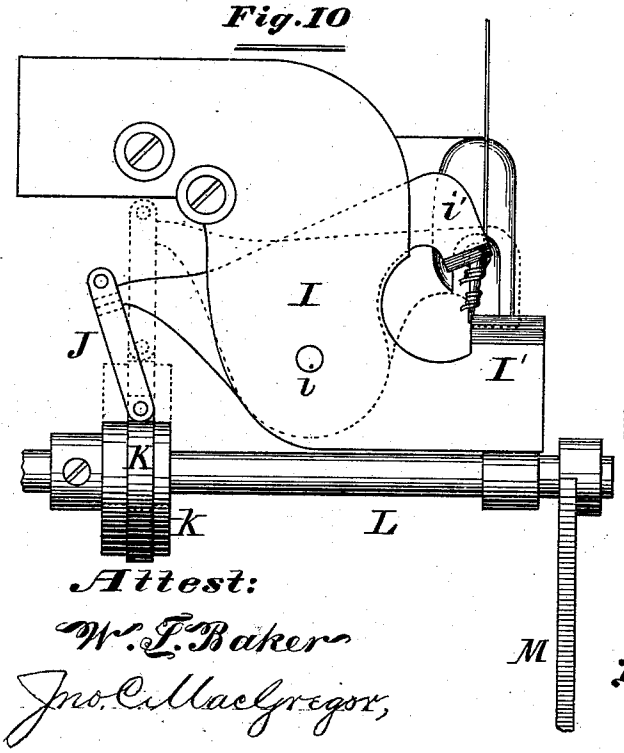


Fig. 12

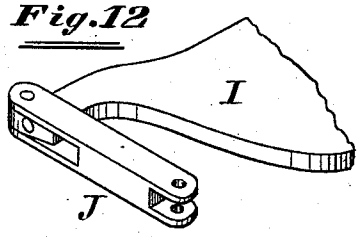
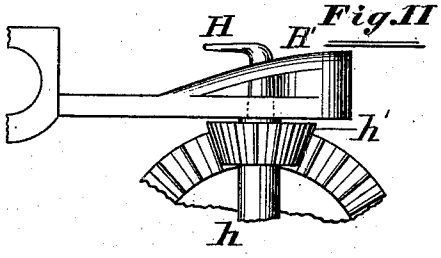


Fig. 11



Attest:

W^m. L. Baker

Jno. C. Macgregor,

INVENTOR:

Daniel Strunk

By Coburn & Thacher

Attorneys.

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

DANIEL STRUNK, OF JANESVILLE, WISCONSIN, ASSIGNOR OF ONE-HALF OF HIS RIGHT TO JAMES B. CROSBY, OF SAME PLACE.

GRAIN-BINDER.

SPECIFICATION forming part of Letters Patent No. 223,773, dated January 20, 1880.

Application filed February 27, 1878.

To all whom it may concern:

Be it known that I, DANIEL STRUNK, of Janesville, in the county of Rock and State of Wisconsin, have invented a new and useful Improvement in Grain-Binders, which is fully described in the following specification, reference being had to the accompanying drawings, in which—

Figure 1 represents a rear side elevation of a grain-binder embodying my improvements; Fig. 2, a plan view of the same; Fig. 3, a detail section of the pitman-connection; Fig. 4, a side elevation of the binder, looking from the front of the harvester; Fig. 5, a front elevation of the binder; Fig. 6, a detail perspective of the head of the binding-arm and twister-hook on an enlarged scale; Fig. 7, an elevation of the cam and switches for guiding the binding-arm; Fig. 8, a rear end elevation of the binder; Fig. 9, a vertical section, on an enlarged scale, through the tension device and spool-holder; Fig. 10, a detail plan view, on an enlarged scale, of the wire-cutter and bundle-discharger; Fig. 11, a similar elevation of the twister-hook and incline by its side; Fig. 12, a similar perspective of a portion of the cutter and its connecting-rod.

My invention relates to that class of automatic grain-binders in which a vibrating binding-arm is used, and in which the binding material is wire.

The invention consists in the combination of a jointed vibrating binding-arm, a rock-shaft, and mechanism for controlling the outer end of the binding-arm, whereby it is caused to move in different paths as the binding-arm is vibrated.

It also consists in various combinations of devices, all of which will be hereinafter more fully described, and pointed out definitely in the claims.

In the drawings, A represents the grain-receiver, which is provided with a slot, *a*, to accommodate the movement of the binding-arm and the bundle-discharger.

A suitable frame, B, is provided for the mounting and support of the operative parts of the binding mechanism, the upper part, *b*, of which projects inward over the receiver. A shaft, C, is mounted on this upper projecting arm, *b*, to the inner end of which is attached the binding-arm D. This binding-arm is made of two parts, pivoted together, so as to constitute a jointed binding-arm. The head portion is the longer, and is constructed with a heel-extension, *d*, which projects back over the other section of the arm, as shown in Fig. 4 of the drawings, and on its extreme rear end is a pin, *d'*.

A cam, E, is also attached to the inner end of the frame-piece *b*, and arranged so that the pin *d'* on the binding-arm will enter the cam-groove *e* in the inner face of the cam. This groove is of the shape shown in Fig. 7 of the drawings, one section running around near the outer edge of the cam, the two extremities being joined by a section made on a longer curve.

Spring-switches *e'* are attached to the cam and arranged in the cam-groove, one at each junction of the two sections thereof.

On the outer end of the shaft C is a crank, *c*, which is connected, by a pitman, C', with one of the wheels of the main gearing of the binder. The crank *c* is provided with a slot, *c'*, and the pitman is connected thereto by means of a pin, c^2, which is inserted in the crank-slot, being held in place by a nut, and is adjusted, to regulate the throw of the crank, by means of a set-screw, as shown in Fig. 3 of the drawings.

A spring, F, is attached at one end to a suitable support, F', arranged at any convenient place on the machine. The upper end of the spring is left free, and is provided with an arm or plate, *f*, on which is mounted the spool of band-wire *f'*.

It is evident, therefore, that the support of the spool is elastic, and a screw, f^2, inserted in the spring-support F' opposite to the spring, provides a means for adjusting the elastic spool-standard, for it is evident that by turning the screw the distance to which the spring may be drawn inward may be nicely regulated, and the construction and arrangement of the spring are such that its elasticity will always throw it out from the screw-pin whenever freed from restraint.

The wire running from the spool passes around a tension device, which is also mounted

on the elastic spool-support. It consists of a plain sheave, G, mounted loosely on a pin, *g*, attached to the support and held between loose plates *g'*, above the upper one of which is a spring, g^2, the tension of which may be adjusted by means of a nut, g^3, on the upper end of the pin, thereby regulating the bearing-force of the clamping-plate upon the sheave, so as to make the tension on the wire greater or less, at pleasure.

The wire is carried from the tension device and led around a sheave on the supporting-frame in line with the movement of the binding-arm, whence it is carried down to the twister, as shown in Fig. 4 of the drawings, to which it is secured, as hereinafter described.

The grain is delivered underneath the wire in this position continuously or intermittently, preferably the former.

When the binding-arm starts upon its downward vibration the wire is caught, in a well-known way, by pins on the binding-head, and carried down around the bundle to the twister. The twisting device is a hook, H, of any of the well-known forms now in use, in which the wire is secured to the hook by the coil formed during the operation of twisting the band. The twister is mounted on a shaft, *h*, provided with a pinion, *h'*, which is driven from the main gearing in any suitable way.

In the ordinary construction and arrangement of this device the wire is liable to coil so low down upon the shank of the hook that it will not readily slip up. To avoid this I provide an incline or cam, H', raised on the table, in rear of the twister-hook, and extending forward on both sides of the latter, as shown in Fig. 11 of the drawings, being inclined in the same direction.

This device also prevents the refuse coils or cut ends of the same from becoming tangled with the band-wire when the twisting commences, so as to interfere with the proper operation of the hook and discharge of refuse coil.

The manner in which the band is secured by the twister-hook after the delivery of the second strand of wire to it by the binding-head is well known, and does not require description here.

The movement of the parts is so timed that the binding-arm is stopped and held in an elevated position, about as shown in full lines in Fig. 4 of the drawings, the pin on the heel-extension being in the inner portion of the cam-groove *e*. At the proper time the movement of the crank-shaft C is commenced, by means of which the binder-arm is vibrated downward. It is evident that without the pin and groove the binding-arm, during this movement, will be, to all intents and purposes, a rigid arm, the heel-extension resting upon the upper section of the arm.

When the binding-arm has reached the limit of its downward stroke and delivered the wire to the twister the pin *d'* has passed to the extreme lower end of the cam-groove and outside of the lower switch, *e'*, which closes behind it in the position shown in Fig. 7 of the drawings. When the upward vibration of the arm commences it is evident that as the pin cannot enter the inner groove of the cam, it must follow the outside one, thereby flexing the arm in such a manner as to lift the head immediately from the wire and above the grain which is being delivered to the receiver.

It is evident, therefore, that there will be no deflection of the wire during the return stroke of the arm. The upward movement of the arm is continued until the pin *d'* reaches the upper extremity of the outer cam-groove and passes the upper switch, *e'*, as shown in dotted lines in Fig. 4, when it starts in the opposite direction, the pin being now forced into the inner groove, and stops in the position shown in full lines, as heretofore mentioned.

The path of the binder-head is in the arc of a true circle, and the twister is located almost directly underneath the axis of the binding-arm; hence the binder-head will stop in its downward movement at its lowest descent, and consequently there will be no slack wire to take up, resulting from the downward stroke of the arm. If, however, through lack of nice adjustment or perfect working of the parts, there should be a slight slack produced, it will all be taken up by the recoil of the spring-support of the spool, which is drawn up against the adjusting-pin when the wire is put around the bundle. The band-wire will thus always be kept taut.

A band-cutter, I, is pivoted to the supporting frame or table by a pin, *i*, as shown in Fig. 10 of the drawings. This cutter is of peculiar form, as shown in the drawings mentioned, being curved and then bent at its outer end, which is the cutting-edge *i'*, so that the latter will be nearly in line with the pivot, and, when the cutter is vibrated to bring the edge against the stationary cutter I', on line nearly at right angles to the direction of the wire, as shown in dotted lines of Fig. 10.

The knife is extended in rear and at the side of the pivot, and this head-extension is hinged to a connecting-rod, J, the other end of which is hinged to a strap, K, on an eccentric, *k*, on the shaft L. From this construction and arrangement of the cutter the latter is caused to swing back or sidewise entirely out of the way of the wire and twister after it has cut the twist.

The shaft L is geared to the main driving mechanism, and carries upon its inner end an arm, M, which is fastened thereto. The shaft is arranged so that this arm is in line with the slot in the receiving-table, through which it is projected by the revolution of the shaft, the arrangement being such, also, that the arm comes up behind the bundle and pushes it off from the table after it is bound.

The mechanism for operating the different parts is timed so that when the twister stops after twisting the band the shaft L commences to rotate, thereby vibrating the knife to cut

the band, and the relative arrangement of the eccentric on this shaft and the discharger M is such that the latter is brought up behind the bundle to discharge it from the table just after the band is cut, and is stopped in a vertical position above the shaft, and serves as a stop against which the bundle may be compressed.

The adjustability of the connection between the pitman and the crank on the binding-arm shaft permits the movement of the latter to be nicely regulated, so as to bring the binder-head always into the proper position in relation to the twister.

I am aware that vibrating binding-arms are old; but there has been an obstacle to their use when mounted on a stationary support, from the fact that on the return stroke they interfere with the delivery of the grain. The jointed arm and cam-guide in my improvement remove this difficulty entirely, and enable me to use a fixed support for the binding-arm without the necessity of making the latter rotating.

The operation of my improvements has been set forth in the description above, and does not require repetition; and the advantages derived from my improvements have also been set forth in connection with the explanation of their construction and operation.

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

1. In a grain-binder, a vibrating jointed binding-arm composed of two sections hinged or pivoted together, in combination with a rock-shaft and mechanism whereby the binding-head or outer section is caused to move in different paths as it vibrates and is lifted from the wire and above the grain upon its return or backward stroke, substantially as described.

2. The vibrating jointed binding-arm D, provided with a guiding-pin, d', in combination with the cam E and rock-shaft C, whereby the binding-head is moved in different paths on its upward and downward strokes and is lifted from the wire, substantially as described.

3. The rock-shaft C, in combination with the jointed binding-arm D, attached thereto, and provided with a pin, d', on the heel-extension of the lower section, and the cam E, having a groove, e, in its inner surface, provided with spring-switches e', substantially as described.

4. An elastic support on which the band-spool is mounted, in combination with a device whereby the movement of the yielding support is adjusted, substantially as described.

5. The spool-supporting spring F, in combination with the adjusting-screw f^2, substantially as and for the purpose set forth.

6. The cam or incline H′, arranged in rear and at the sides of the twister-hook, substantially as and for the purpose set forth.

7. The pivoted knife I, in combination with the eccentric k, eccentric-strap K, and connecting-rod J, attached to the strap and extension of the cutter, substantially as described.

D. STRUNK.

Witnesses:
W. R. FOLLANSBEE,
SAMUEL KNIGHT.