2 Sheets—Sheet 1.

D. STRUNK.

Grain-Binder.

No. 223,407. Patented Jan. 6, 1880.

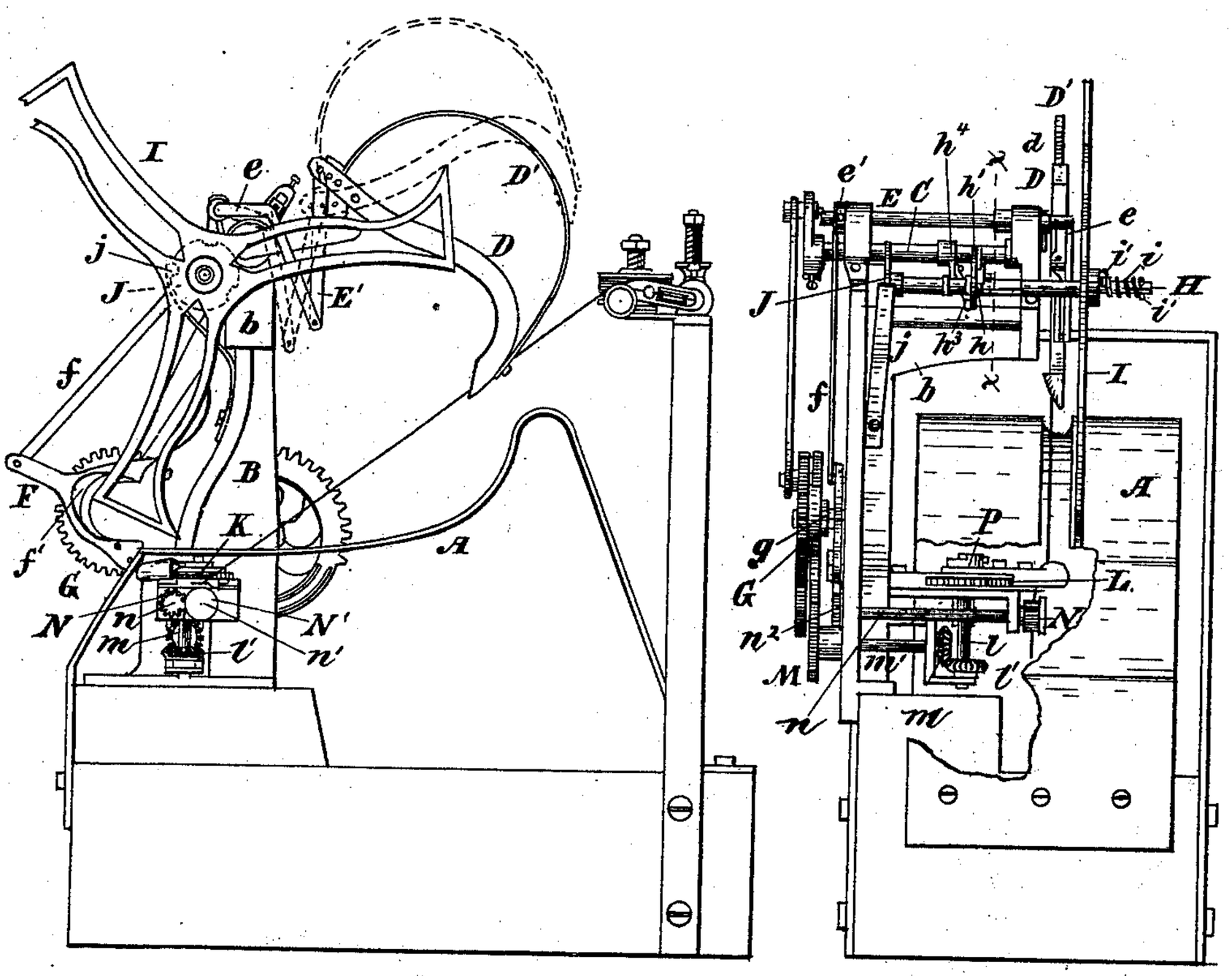

Fig. 1.

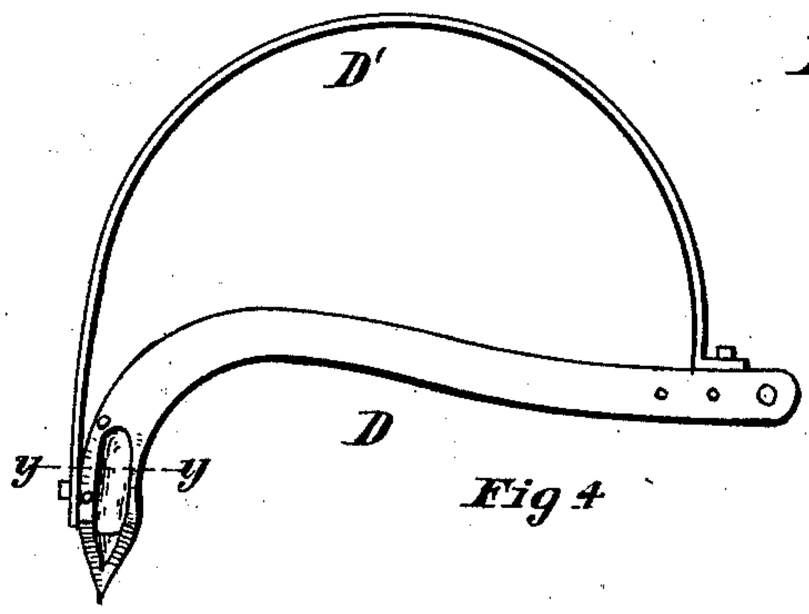

Fig. 2.

Fig 4

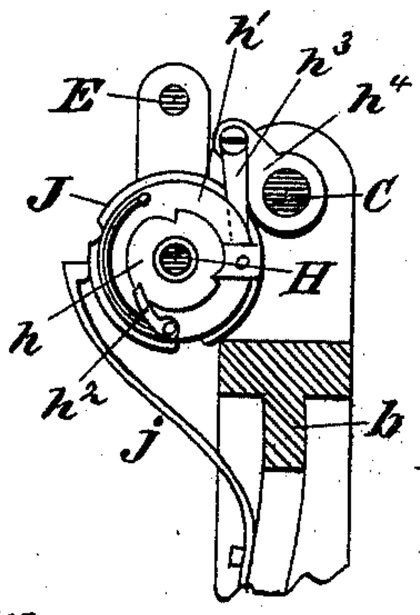

Fig 3

Fig 5

Witnesses

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2 Sheets—Sheet 2.

D. STRUNK.

Grain-Binder.

No. 223,407. Patented Jan. 6, 1880.

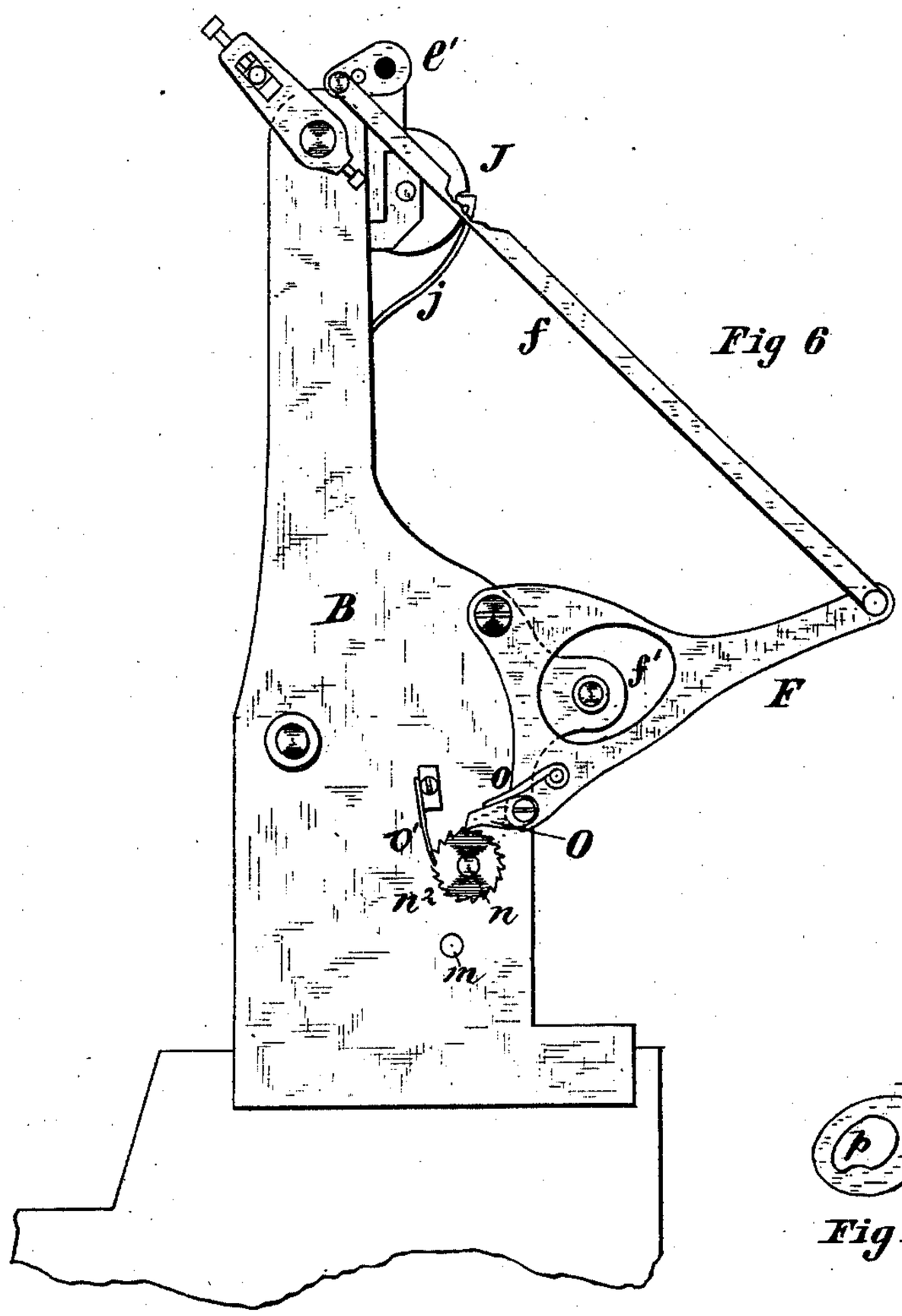

Fig 6

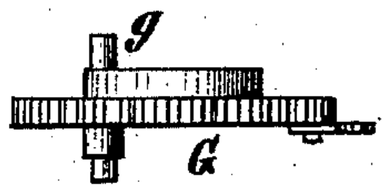

Fig 7

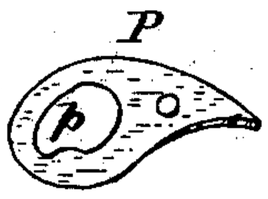

Fig 11

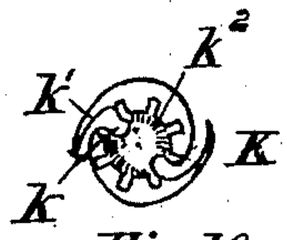

Fig 10

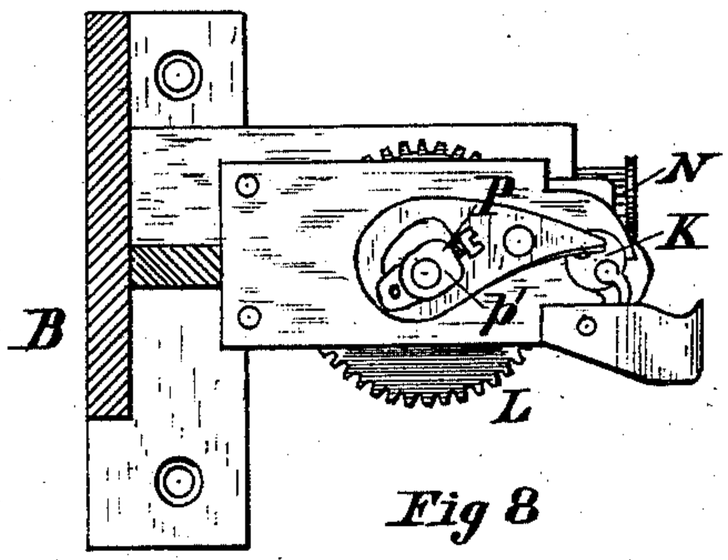

Fig 8

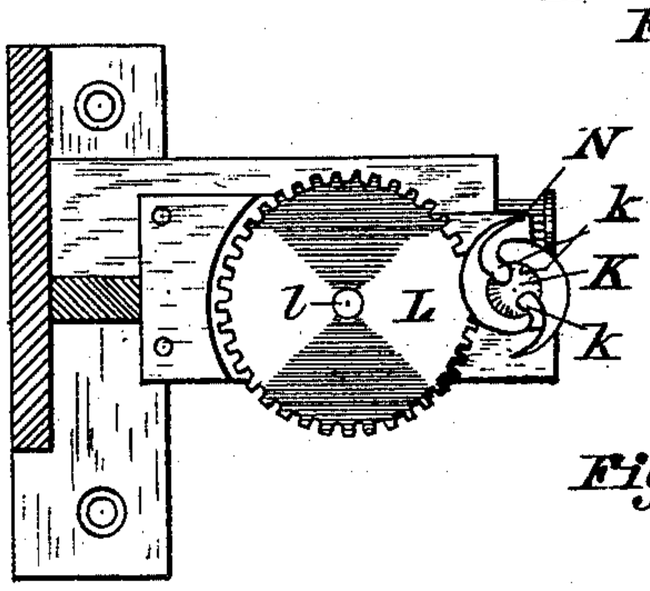

Fig 9

Witnesses

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Inventor

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Attorneys

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. 223,407, dated January 6, 1880.

Application filed March 24, 1879.

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 certain Improvements in Grain-Binders, which are fully described in the following specification, reference being had to the accompanying drawings, in which—

Figure 1 represents an end elevation of a binder embodying my improvements; Fig. 2, a front elevation of the same; Fig. 3, a detail section, on an enlarged scale, taken on the line X X, Fig. 2; Fig. 4, a detached view of the point of the binding-arm on an enlarged scale; Fig. 5, a section taken on the line Y Y, Fig. 4; Fig. 6, an end elevation, showing the devices used in operating the band-holders; Fig. 7, a detail view of the pinion and pin which operate the cam-lever; Fig. 8, a plan section of the twisting and cutting devices on an enlarged scale; Fig. 9, a similar view with the cutting mechanism and blade removed; Fig. 10, a bottom view of the twister; Fig. 11, a detached view of the cutter.

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.

It will be understood, of course, that the binding apparatus is to be attached to a grain-harvesting machine; but, as the attachment may be made in any well-known way, and my improvements are confined to the binding apparatus alone, I have not shown the harvesting-machine.

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

Some of the main features of the binder here shown have been fully described and shown in a prior case of mine, and hence will be only alluded to in the present description.

In the drawings, A represents the grain-receiver, which is provided with a suitable slot to accommodate the movements of the binding-arm and the compressor.

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 frame projects outward over the receiver, and rock-shaft C is mounted on this upper portion of the frame, to the inner end of which shaft is attached the binding-arm D. This binding-arm is preferably jointed—that is, made of two parts pivoted together, as in my former case, though my other improvements may be used with a stiff arm as well.

The rock-shaft C is oscillated by means substantially the same as in my former invention, and, as before, the head portion of the binding-arm is provided with a heel-extension, *d*, which projects back over the other section of the arm.

A guard, D′, is also attached to the upper side of the head-section of the binding-arm. This guard is of metal, in the form of a bow, and its ends are attached, respectively, to each end of the section. It may also be used with a stiff binding-arm, in which case it would be attached to each end of the arm.

The second rock-shaft, E, is also mounted on the upper part of the frame, and is provided at its inner end with a bent crank, *e*, the outer end of which is connected by a link, E′, with the heel-extension *d* of the binding-arm. At the other end of the rock-shaft E is the crank-arm *e′*.

On the back portion of the upright frame is provided a cam-lever, F, the outer end of which is connected to the crank-arm *e′* by a pivoted rod or link, *f*. The lever F is of triangular shape, and in its body is cut a cam, *f′*.

The gear-wheel G, mounted on the same portion of the frame, and which oscillates the shaft C by means of a crank-pin and connecting-rod, is also provided on its inner face with pin *g*, which is arranged to move within the cam-opening *f′*, thereby vibrating the lever F on its pivot, which is located at the inner upper corner thereof. The parts are all arranged so that this lever will be raised just as the binding-arm starts upon its upward or return movement, thereby oscillating the shaft E, and by means of the crank *e* and link E′ turning upward and backward the heel-extension *d*, which vibrates the outer section of the binding-arm on its pivot, and so turns the binding-head that it is lifted from the wire, and moves back on a path above and in front of the path followed on its downward stroke. Just as the binding-arm reaches its upward limit the same

devices operate to straighten it out, so that it is ready for the downward stroke, and at this point there should be proper provision for a rest of the arm, if it is necessary.

The shaft H, mounted on the upper portion of the frame, carries upon its inner end a star-wheel, I, mounted loosely thereon, and attached thereto by a coil-spring, *i*, and pins *i'*, so that the wheel will yield on its shaft to pressure in one direction, but is held by a stop from movement in the other direction.

On the shaft H is a fixed notched disk, *h*, and by the side of it a larger disk, *h'*, mounted loosely on the shaft, and provided with a spring-pawl, h^2, arranged to engage with the notches in the disk *h*. The loose disk *h'* is also connected, by a link, h^3, with the crank-arm h^4 on the rock-shaft C, and the parts are so constructed and arranged that when shaft C is turned to raise the binding-arm the shaft H is rotated far enough to bring one of the compressing-arms down just a little beyond the twister, as shown in Fig. 1 of the drawings, in which position it is locked by means of a fixed notched disk, J, on the shaft and spring-detent *j*. Here it is firmly held during the downward vibration of the binding-arm, the bundle being compressed between said arm and the arm of the wheel standing in front thereof, and in the movement of the shaft C to throw the binding-arm downward the disk *h'* will be turned back on the shaft H, the spring-pawl slipping over the disk *h* into position to engage with another notch thereon upon the reverse movement of the shaft C.

The wheel I is provided with three arms, though, of course, more may be used, if necessary, and it will be seen that it is a rotary yielding compressor, intermittent in its movements, and each arm operating successively. It will also be seen that upon each forward movement of this compressor the descending arm will also act as a bundle-discharger, pushing the bundle before it from the receiver, so that each arm performs two functions—first, to discharge the bundle as it comes into place, and, secondly, in its fixed position to act as a yielding compressor for the new bundle as it is gathered down.

The mechanism above described for rotating the compressor may be changed for some other devices, and perhaps a more simple mechanism will be desirable. For instance, the shaft may be geared to the main gearing of the binder, so as to be moved intermittently by it, and to be locked in position in the same manner as the binding-arm and twisting mechanism.

The twister K is provided with slots *k* on each side thereof, as shown in Figs. 9 and 10 of the drawings. It is also provided with hooks *k'*, projecting outward from each side of the twister, and extending around across the openings into the slots, for the purpose of gathering the strands of the band. It is also provided, as usual, with a gear-pinion, k^2, by means of which it is rotated by a gear-wheel, L, on the upper end of an upright shaft, *l*, which carries a bevel-pinion, *l'*, on its lower end. This pinion meshes with a similar pinion, *m*, on a horizontal shaft, *m'*, which carries on its outer end the driving-gear M, which is rotated at the proper intervals by a gear-section on the main driving-gear of the binder. Just below the twister are two toothed wire-holding pinions, N and N', mounted on horizontal shafts *n n'*, the former of which extends through the upright portion of the frame, and carries upon its outer end a toothed or ratchet wheel, n^2, as shown in Fig. 6 of the drawings.

The pinions N N' are for the purpose of holding the wire, which is caught and crimped between the teeth of the pinions, and the refuse portion fed out from between the same in a well-known way. They are given an intermittent rotation by means of a dog or pawl, O, which is pivoted to the lower inner corner of the lever F, and is caused to engage with the teeth of the ratchet-wheel n^2 by a spring, *o*, the parts being arranged so that when the lever is thrown downward, thereby pushing the inner lower corner backward, the ratchet-wheel will be turned a certain distance.

The ratchet-wheel is also provided with a spring pawl or detent, *o'*, which is arranged to engage with the teeth and prevent the wheel from rotating backward.

The cutting-blade P is pivoted to the plate over the twister, and has an enlarged extension back of its pivot, in which a cam-opening, *p*, is cut. The upper end of the shaft *l* projects through this opening, and is provided with a crank-pin, *p'*, which is driven around within the opening, and thereby vibrates the cutter-blade at the proper time to cut the wires.

The end of the band-wire being held between the pinions N N', the movement of the twister is so timed that, on starting, one of its hooks takes up the wire, which is carried into one of the slots on one side of the twister and makes a first strand of the band. As the rotation of the twister proceeds the other hook gathers the second strand of wire which has been brought down by the binding-head, and this strand is carried into the slot on the opposite side of the twister from the first, the movement of the twister being given at the proper time for completing the twist in the band. The twister may, however, take the first wire before the rising of the binder-arm, and then take the second wire on the commencement of its movement to form a new twist.

It will be understood from this description that the two strands of the band to be twisted are gathered into separate slots on opposite sides of the twister, and are then twisted together, a twist being formed both above and below the twister. The cutter is vibrated just as the twist is formed, and before the twister stops, and severs first one wire and then the

other, as each is brought against it, in its position with the blade extending somewhat over the twister.

The band-holding pinions are rotated about as the binding-arm is to commence its downward movement, and the twist below the twister is drawn down between the pinions, from which it is shed out continuously, and serves to insure the proper retention of the band. The band is brought to the twister by the binding-arm in the manner heretofore shown by me, and the binding-head is provided with a recess on its inner side to accommodate the rotation of the twister, as in my former application.

It will be understood, also, that when the jointed arm is used the binding-head will be lifted from the wire and carried up on its backward stroke above the grain, so as not to interfere therewith by the mechanism described above.

As already stated, the guard on the binding-arm and the arms of the rotating compressor are so arranged relatively that the end of the compressor-arm, which moves downward as the binding-arm moves upward, is within the path of the guard on the arm, so that the compressor-arm will not interfere with the grain, which will be held back by the guard. This guard also operates to hold back the incoming grain, which may be delivered while the band is being twisted and the arm is on its downstroke. The parts must, of course, be timed so that the operations herein described will take place at the proper intervals; but this is a matter which is well understood, and the particular mechanism for accomplishing this result, in all respects, it is not necessary to describe here.

The devices for holding and adjusting the band and regulating its tension are the same as shown in my prior invention, and therefore will not be described here. I do not confine myself to the precise form and arrangement of all the parts herein described, as it is evident that mere mechanical changes may be made without departing from the essential features of construction and operation which are peculiar to my improvement.

I am aware that, broadly, a jointed binding-arm is not new, and that the special motion given to the jointed binding-arm is, in some respects, similar to that heretofore shown in harvester-rakes.

I do not here claim, broadly, the combination of a jointed binding-arm and mechanism for controlling the movements of said arm, and compelling its outer section to pursue different tracks or paths in its downward and upward vibrations, as this improvement constitutes the subject-matter of claims in an application of mine of prior date.

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

1. A jointed binding-arm, D, fixed on the vibrating shaft C, in combination with the rock-shaft E, provided with the crank *e* and the link E′, whereby said binding-arm is caused to move over the platform in its upward movement and through the platform in the downward, substantially as and for the purpose set forth.

2. The lever F, provided with the cam-opening *f′*, in combination with the wheel G, provided with the pin *g*, the connecting-rod *f*, rock-shaft E, and rock-shaft C, connected to the wheel G, whereby the binding-arm is vibrated up and down and flexed on its joint at the same time, substantially as described.

3. The rotating star-wheel I, attached to the shaft by yielding connection, to operate as an elastic compressor, against which the bundle is compressed by the binding-arm, substantially as described.

4. The rotating compressor, in combination with the binding-arm and a guard, D′, arranged relatively, so that the compressor-arm, in its downward movement, will be within the path of the guard on its upward movement, substantially as and for the purpose set forth.

5. The rotating compressor I, the shaft H, to which it is attached by an elastic connection, so as to yield thereon, and mechanism whereby an intermittent rotary motion is transmitted to said shaft, and stopping mechanism for locking it at the proper intervals, in combination with a vibrating binder-arm mounted on a separate shaft, substantially as described.

DANIEL STRUNK.

Witnesses:
JOSEPH B. CROSBY,
J. B. ROWLEY.