4 Sheets—Sheet 1.

D. OLMSTED, C. L. TRAVIS & C. R. CHUTE.

Grain-Binder.

No. 202,747. Patented April 23, 1878.

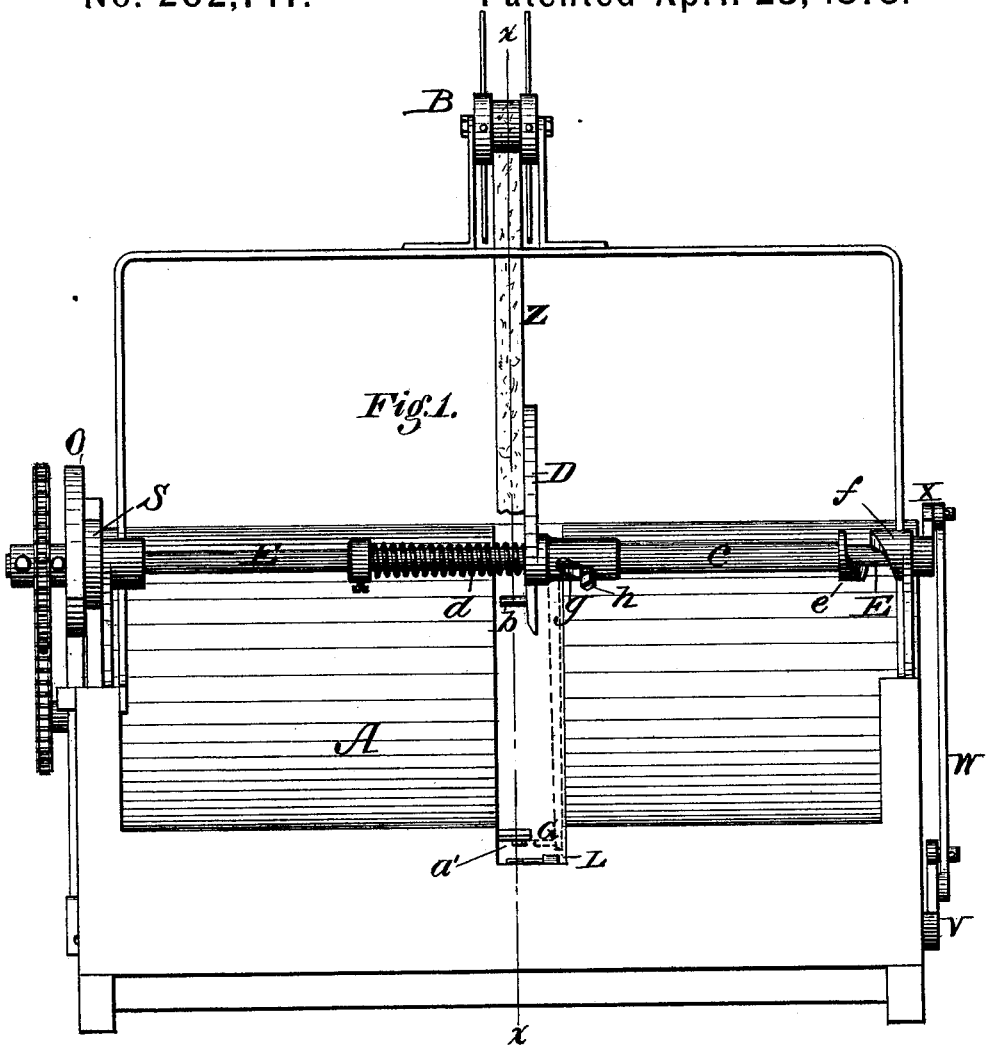

Fig. 1.

Witnesses:
Conn. F. Twitchell
Will H. Dodge.

Inventor:
David Olmsted
Chas. L. Travis
Chas. R. Chute.
By their attys
Dodgeson

4 Sheets—Sheet 2.

D. OLMSTED, C. L. TRAVIS & C. R. CHUTE.

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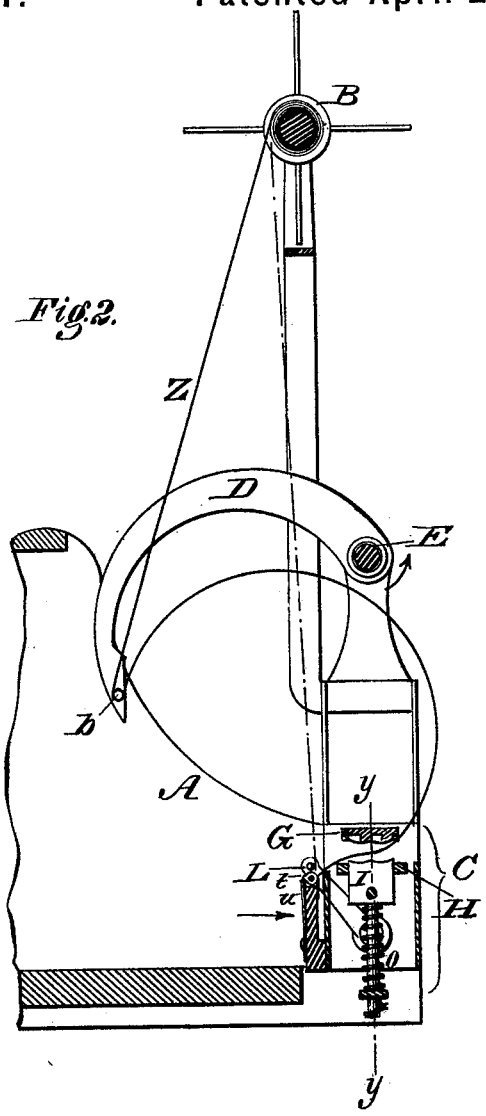
Fig. 2.



Witnesses:

John F. Twitchell.

Will N. Dodge.

Inventor:

David Olmsted

Chas L. Travis

Chas R. Chute.

By their atty,

Dodger Son

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D. OLMSTED, C. L. TRAVIS & C. R. CHUTE.

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Fig. 4.

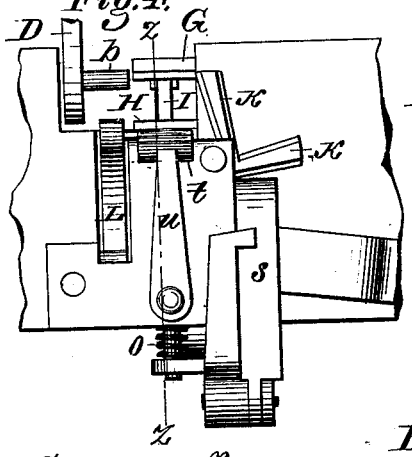


Fig. 5.

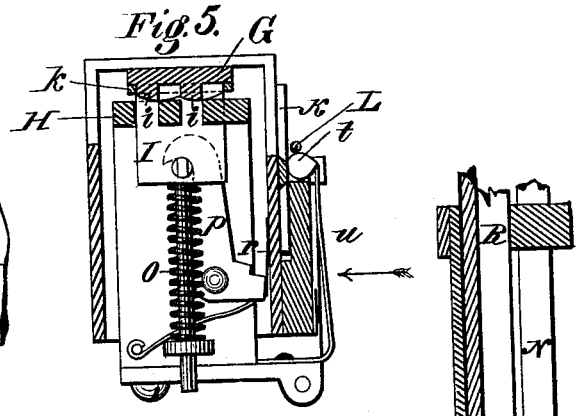


Fig. 3.

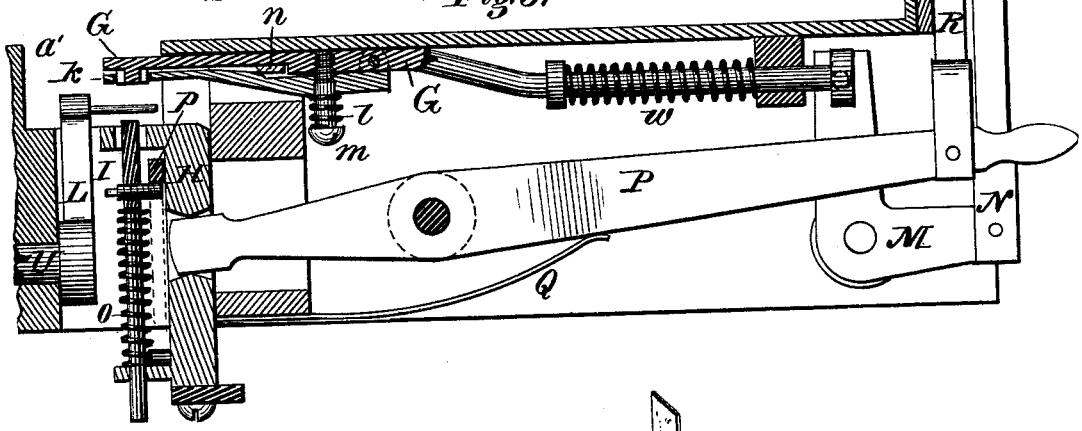
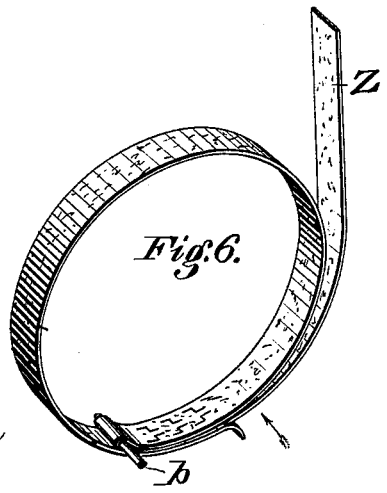


Fig. 6.



Witnesses:
Donn J. Twitchell.
Will N. Dodge.

Inventor:
David Olmsted
Chas L. Travis
Chas. R. Chute
By their attys
Dodgerton

4 Sheets—Sheet 4.

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Grain-Binder.

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Fig. 7.

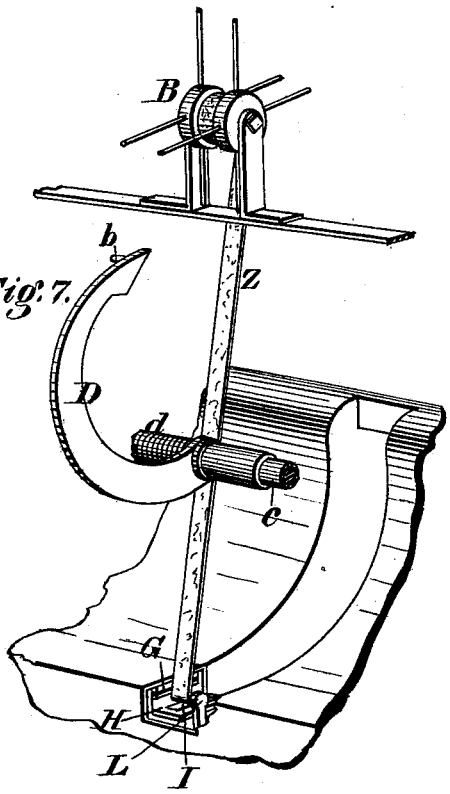


Fig. 8.

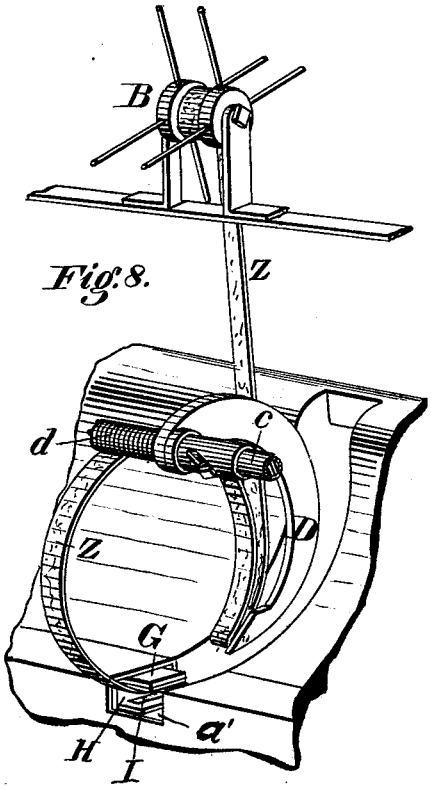


Fig. 10.

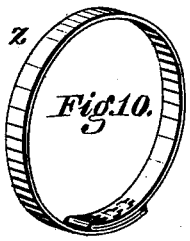
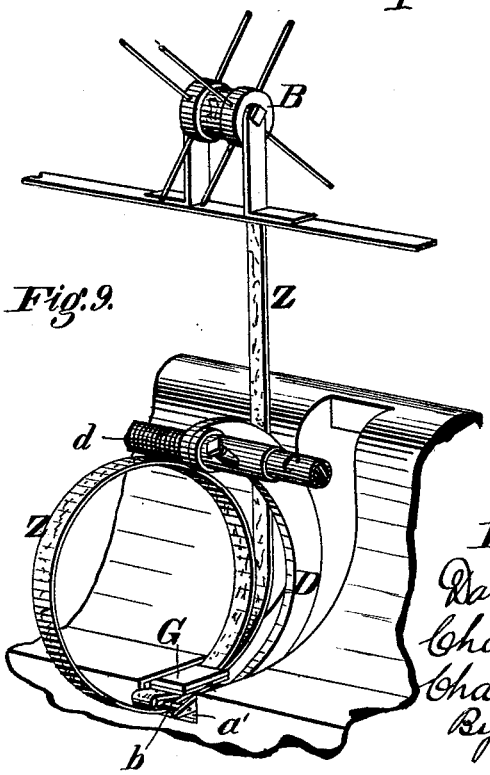


Fig. 9.



Witnesses:
Donn J. Twitchell.
Will N. Dodge.

Inventor:
David Olmsted
Chas L. Travis
Chas R. Chute
By their attys.
Dodger & Son.

UNITED STATES PATENT OFFICE.

DAVID OLMSTED, CHARLES L. TRAVIS, AND CHARLES R. CHUTE, OF MINNEAPOLIS, MINNESOTA, ASSIGNORS TO GEORGE A. BRACKETT, OF SAME PLACE.

IMPROVEMENT IN GRAIN-BINDERS.

Specification forming part of Letters Patent No. **202,747**, dated April 23, 1878; application filed January 18, 1878.

To all whom it may concern:

Be it known that we, DAVID OLMSTED, CHARLES L. TRAVIS, and CHARLES R. CHUTE, of Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain Improvements in Grain-Binding Machines, of which the following is a specification:

This invention relates to a machine for binding grain with bands of prepared paper, such as described in the patents of D. Olmsted, January 11, 1876, No. 171,950, and August 8, 1876, No. 180,910, or with bands of similar material.

The invention consists in the general combination and organization of mechanism whereby the paper is drawn from a roll or coil, carried around the bundle of grain, fastened, and the applied portion severed from the remainder while retaining the end of the latter; in so arranging the parts that the arm which carries the band around the grain moves independently of the band during a portion of its revolution; in a peculiar arrangement of the arm, whereby it is enabled to stop and disengage itself from the band while the motion of its carrying-shaft continues; in a peculiar punch and die to fasten the bands; in a spring-catch to retain the ends of the applied band prior to the action of the fastening-punches; in an arm by which the end of the band is carried between the punch and die; in a knife arranged to catch and sever the band, and in various minor details.

Figure 1 represents a top-plan view of my machine; Fig. 2, a vertical cross-section of the same on the line *x x* of Fig. 1; Fig. 3, a section on the line *y y*, Fig. 2; Fig. 4, a rear view of the band-fastening mechanism, looking in the direction indicated by the arrows in Figs. 2 and 5; Fig. 5, a vertical cross-section on the line *z z* of Fig. 4; Fig. 6, a view illustrating the manner in which the band is formed and applied; Figs. 7, 8, and 9, views illustrating in detail the various steps and the action of the various devices in the application of the band; Fig. 10, a perspective view of the completed and fastened band.

The machine consists, mainly, of a concave receiver, A, into which the grain is delivered by any suitable conveying mechanism, an elevated reel, on which the binding-paper is wound in a long continuous strip, mechanism C, located at the bottom of the receiver, for the purpose of retaining the end of the paper, and fastening and severing the same when applied to the grain, and a rotating arm serving to pass the band around the grain to the mechanism C. The receiver is made of a curved form, inclined downward from one edge to the other, and provided in its middle with a slot or opening, *a*, through which the end of the rotary arm sweeps, and which admits of the arm and band passing freely under the grain. The reel B is mounted on a gallows-frame above the path of the arm, and in the same vertical plane with the arm and fastening mechanism. It may be of any suitable construction, and provided, if desired, with any suitable friction device to produce a proper tension of the band.

While it is preferred to locate the reel at the point shown, and extend the band therefrom to the fastening mechanism, it may be located elsewhere, provided the strip is carried through an eye or guide located at the point now occupied by the reel, it being essential that the strip shall in all cases extend downward, as shown, in the path of the rotary binder-arm, so as to be acted upon thereby.

At its outer end the binder-arm D is provided with a lateral stud or roller, *b*, which serves, as the arm advances, to act against the strip, and push or carry the same downward over and around the grain, as represented in Fig. 2, into the fastening mechanism.

In order to secure the proper action of the parts it is necessary that the binding-arm, after having carried the strip into the fastening mechanism, shall disengage itself therefrom, and this is accomplished by arranging the arm to move laterally, and withdraw its stud or roller *b* from the strip at the proper moment, the arm being at the same time permitted to cease its rotation or turn slightly backward in order to insure its disengagement, and this, too, while its shaft E continues to rotate. The manner in which these movements are secured will appear on referring to Fig. 1, in which it

will be seen that the binder-arm is provided with a long sleeve or tubular axis, *c*, which is mounted loosely on the shaft E. A spring, *d*, mounted on the shaft, bears at one end against a collar thereon, and at the other against the binder-arm, and serves, when the parts are released, to push or slide the arm upon the shaft toward the right, so that the stud or roller *b* is carried out of the reach of the band.

In order to hold the arm over toward the left during its descent, so that it may act upon the band, its sleeve *c* is provided at one end with a cam, *e*, which acts against a corresponding cam, *f*, on the frame, as shown in Fig. 1, the cams being so arranged that they push and hold the sleeve and arm over to the left during the descent of the latter, and then, as the end of the arm leaves the fastening mechanism C, they permit the arm to move, under the action of the spring, to the right, as indicated by the dotted lines in Fig. 1, the arm being gradually carried to the left again as it rises and again approaches the strip. The stoppage or slight backward movement of the arm is secured by providing the sleeve *c* with an oblique or spiral slot, *g*, as shown in Fig. 1, and inserting a pin, *h*, through the same into the shaft, the groove having a backward inclination toward the right. The pin serves to transmit the rotary motion from the shaft to the sleeve and arm, and also, in conjunction with the slot, to give the sleeve and arm a limited rotary motion on the shaft as they are moved laterally thereon.

As long as the arm is held over to the left by the cam, so as to act upon the strip Z, the stud rests in the right and rear end of the slot, as shown in Fig. 1, thereby holding the arm in its foremost position on the shaft; but as the arm shifts laterally the spiral groove causes it to turn backward around the shaft, so that for an instant, while it is moving laterally, the arm ceases its forward rotation and turns slightly backward, the shaft E meanwhile continuing its forward rotation.

From the foregoing it will be seen that the binder-arm, when at its highest point, is moved to the left to engage with the strip Z, and held in that position as it descends, and until it has passed the band-fastening devices C, when its rotation ceases momentarily, and it moves simultaneously backward and to the right, to disengage from the strip, after which it resumes its rotation, and during its rise gradually shifts over to the left again.

The mechanism for securing the band consists, essentially, of a punch and die to form interlocking tongues or lips in or on the lapped ends of the applied band, a clamp or dog to hold the ends previous to and during the punching or fastening operation, and a cutter to sever the applied band from the main strip Z, all of which parts will be readily understood on reference to the drawing.

As shown more particularly in Figs. 1 and 4, the frame or housing in which the band-fastening devices are located has a depression or slot, *a'*, forming a continuation of that in the receiver, through which the binding-arm sweeps, and it is in this depression or opening that the fastening operation is performed by devices which advance from its sides and bottom at the proper times.

Referring to Figs. 1, 2, 3, &c., G represents the upper or male die, H the lower or female die, and I the spring dog or clamp to hold the ends of the applied band. The male die G is arranged to slide horizontally, so that its end may be protruded through the side of the recess *a'* into the path of the strip or band, as shown in Figs. 2 and 3, or drawn back entirely out of the way, as in Fig. 7, and it has its punching or cutting teeth *i* formed on the under face of its end, as shown. The female die H is arranged to slide upward in vertical guides over the teeth of the male die, when the latter is in its forward position. For the purpose of insuring the release of the punched bands from the male die, that the latter may slide back freely from the band, a thin stripper-plate, *k*, is hinged to the under side of said die, with its end perforated and fitted around the teeth or cutting edges of the die, as shown in Figs. 3, 4, and 5. A spring, *l*, mounted on a screw, *m*, as shown in Fig. 3, serves to hold the stripper up out of action when the punch is in its forward operative position, while a stationary bar, *n*, having a beveled edge, acting against an incline on the stripper, serves to force the latter downward as the die begins its backward movement, the stripper in its descent forcing the band off from the die. The clamp or dog I, to hold the ends of the band while being punched, is mounted in guides on the female die H, and arranged to play upward through the top of the same directly against the teeth or cutting portion of the male die, as shown in Figs. 4 and 5, a spiral spring, *o*, being applied to thus force the clamp upward whenever it is released independently and in advance of the die H.

The die H has on its side, as shown in Figs. 3 and 5, a pivoted spring-hook, *p*, and when the die ascends to effect the punching operation, this hook engages over a pin on the dog or clamp, as shown in Fig. 5, so that when the die descends it carries the clamp down with it, as in Fig. 3, thereby releasing the punched band.

The release of the clamp I, that it may ascend in advance of the die H, is effected by means of a spring-catch, *r*, secured to the main frame, as shown in Fig. 5, the catch engaging over the hook *p* when the die descends, and then tripping the same as soon as the die H commences to rise, the rise of the dog taking place immediately after the binding-arm has carried the bands between the dies, and as it is about disengaging from the strip by its lateral motion.

The cutting of the band is accomplished by a rotary cutter, K, pivoted in the frame immediately behind the lower die, and provided

with four radial arms or blades, which act successively. A pawl, S, pivoted to the rear side of the lower die H, acts against the arms of the cutter K, as represented in Fig. 4, giving the same a quarter-revolution at each action of the die. The cutter is so located and arranged that each blade, in turning down from an upright to a horizontal position, engages over the strip Z, just in rear of the point where it meets the bundle of grain, and, acting in connection with a stationary blade, it severs the applied band from the strip Z at the point indicated in Fig. 6. At the same time that the severance occurs, the blade pinches the end of the strip Z between its side and a pivoted eccentric, *t*, which latter is arranged and acted upon by a spring, *u*, in the manner shown in Figs. 4 and 5, so that, in connection with the blade, it holds the end of the strip securely, as shown. When the severance of the band and the discharge of the bound bundle occur, the strip Z extends from the cutter and eccentric upward to the reel behind the dies.

In order to pass the end of the strip between the dies, as shown in Fig. 2, in position to be extended thence around the grain, a rocking carrier-arm, L, is arranged as shown in Figs. 1, 2, 3, and 4. The arm is mounted at its lower end on a rock-shaft, and provided at its upper end with a lateral stud or pin, which normally rests upon the strip-pinching device, behind the cutter, as shown in Fig. 2, so that it lies behind the main strip when the severance occurs. After the severance and the discharge of the bound bundle, the lower die descends, and the upper die G is drawn back out of the way; and then the carrier, swinging forward, extends the strip Z from the holding devices over and across the lower die H, as represented in Fig. 7, the upper die sliding forward immediately thereafter over the strip, as shown in Figs. 2 and 8, and the carrier then swinging back to its original position.

The mechanism by which the dies G and H are actuated is clearly shown in Figs. 1 and 3. The upper die is thrown forward by means of a spiral spring, *w*, but drawn back by means of an elbow-lever, M, actuated by a vertically-sliding rod, N, which is depressed at proper intervals by a cam, O, secured to the shaft E, by which the binding-arm is carried. The lower die is operated and held in place by a lever, P, which is operated to depress the die by a spring, Q, but caused to elevate the die by a vertical slide, R, depressed by a cam, S, on the binder-arm shaft. The movements of the carrier-arm L are produced by providing the outer end of the rock-shaft U, on which it is mounted, with an arm, V, and mounting on the latter the lower slotted end of a pitman, W, which has its upper end mounted on a crank, X, on the binder-arm shaft E, as shown in Fig. 1. The action of the slotted pitman, although driven at its upper end by the continuously-rotating crank, is to impart an intermittent vibratory motion to the arm V and rock-shaft.

Having described the action of the various details separately, the operation of the machine as a whole will be described: The reel being provided with a continuous strip of paper of great length, the end of the strip is drawn downward and secured, by the cutter K and eccentric *t*, in the position shown by dotted lines in Fig. 2, the lower die H and clamp I being down, and the upper die G drawn back out of action, and the binder-arm turned back out of the way. Grain being delivered into the receiver and the machine set in motion, the arm L first swings forward and carries the strip Z across the lower die, as shown in Fig. 7, whereupon the upper die G slides forward above the strip, as shown in Fig. 8, and the carrier swings back to its original position, as shown in Fig. 2. The grain falling into the receiver rides against the upright band on the inside, as shown in Fig. 2; and as the binder-arm swings inward and downward, its pin *b* acts against the strip, and forces the same downward over and around the grain, in the manner depicted in Figs. 2 and 8, and under the same, to and between the dies. As the arm approaches the dies the strip becomes doubled over the pin in the form represented in Figs. 2 and 8, in which form, doubled upon itself, it is carried by the pin or roller of the arm between the upper and lower dies G H, and lapped over its own end or extremity, previously inserted, in the manner shown in Fig. 6, completely encircling the grain. As soon as the doubled strip has been passed between the dies, the clamp I rises and holds what are now the two ends of an applied band firmly together, as shown in Fig. 9, while at the same moment the binder-arm moves laterally, and disengages itself entirely from the strip, as shown in the same figure.

The lower die H rises, and, punching the lapped portions of the band, fastens the same firmly around the bundle, while the cutter K, being at the same time rotated, severs the strip close to its junction with the bundle, and retains the new end. The lower die H and clamp I next descend, the upper die G slides back out of the band, and the bundle is discharged from the machine, after which the operation of the various parts is repeated, and so on continuously.

While the construction and arrangement of details shown and described are considered the best that can be used, it is manifest that many changes may be made without changing essentially the action of the machine or departing from the limits of the invention. Motion may be communicated to the binding devices proper in any suitable manner; the forms of the dies and the manner of mounting them may be varied; the binder-arm may be driven by any other devices producing the same action on its part, the invention consisting, broadly, in the combination of mechanism for

passing the paper strip around the grain, and punching devices adapted to fasten the ends by punching, cutting, indenting, or bending them in such manner as to fasten them together.

It is obvious that the punching and fastening devices may be used, in connection with suitable feeding mechanism, to secure bands cut to a suitable length before their introduction into the machine.

Having thus described our invention, what we claim is—

1. In a machine for binding grain with paper or similar bands, the combination of a binder-arm or band-carrier, to carry the band around the grain, and punching mechanism for securing the applied band upon the grain, substantially as shown and described.

2. In a grain-binding machine, the combination of a reel or guide, B, a binding or band-carrying arm, D, and a mechanism, C, adapted and arranged to sever the band and punch the ends of the applied band in such manner as to fasten them directly together, substantially as shown.

3. In a grain binding machine, the combination of a reel or guide, B, band punching and cutting mechanism C, and a binding or band-carrying arm, D, arranged to carry the band around the grain and between the dies of the punching mechanism, and then disengage therefrom, substantially as shown.

4. In a grain-binding machine, a binder-arm, provided with a laterally-projecting pin or band-carrying device arranged to disengage laterally from the band after passing the same around the grain.

5. In a grain-binding machine for applying paper and similar bands, the combination of two band-fastening dies with a binder-arm or band-carrier arranged to pass the band around the grain and between the dies, and then disengage therefrom.

6. The rotating and laterally-moving binding-arm D, provided with the lateral pin or roller *b*, and arranged to operate substantially as shown.

7. In combination with the shaft E, the binding-arm D, provided with the sleeve *c* and cam *e*, the fixed cam *f*, and thespring *d*.

8. In combination with the continuously-rotating shaft E, the binder-arm D, having the sleeve *c*, with its slot *g* and cam *e*, the pin or roller *h*, and cam *f*, and spring *d*, whereby the binder-arm is caused to move laterally and backward, and then to its original position again, during the rotation of the shaft.

9. In a grain-binding machine for applying paper and similar bands, male and female dies arranged to act directly upon the lapped ends of the applied band, for the purpose of fastening the same together.

10. The laterally-sliding die G, in combination with the vertically-moving die H, substantially as shown.

11. In combination with the dies G H, the vertically-moving clamp I, arranged to rise in advance of the lower die.

12. The combination of the vertically-moving die H, clamp I, hook *p*, and releasing-spring *r*, substantially as shown.

13. In a grain-binding machine, the combination of a binding-arm or band-carrier, male and female dies for punching and fastening the ends of the applied band, and a stripper, K, arranged to remove the band from the male die after being punched.

14. In a grain-binding machine, the combination of a binding or band-carrying arm, male and female dies to fasten the band, and a carrier, L, to pass the first end of the band between the two dies.

15. In combination with the dies G and H and binder-arm D, the rotary band-cutter K, substantially as shown.

16. In combination with the band-cutting device K, the eccentric *t* and spring *u*, arranged to assist the same in holding the severed end of the band.

17. In a grain-binding machine, two movable dies, a cutting and retaining device, a carrier, L, and a binder-arm, combined and arranged to operate substantially as shown and described.

18. In a grain-binding machine, the combination of two dies to punch the ends of the applied band, with a binder-arm arranged to carry the end of the band between the dies, and a clamp to hold the lapped ends of the band prior to their being punched.

19. The grain-band of paper or similar material, having one end doubled and laid upon the other, and locked thereto by tongues, lips, or shoulders, substantially as shown and described.

20. The combination of the two dies G H and the binder-arm D, all connected with and actuated by the single shaft E.

21. In a machine for binding grain with paper and similar flat bands, male and female dies arranged to act one inside and the other outside of the applied band, to fasten the same in place.

22. In a machine for binding grain with paper and similar bands, punching devices arranged to act upon the inside and outside of the applied band, and then disengage therefrom to permit the removal of the bundle.

DAVID OLMSTED.
CHARLES L. TRAVIS.
CHARLES R. CHUTE.

Witnesses:
A. DELAND,
HENRY M. WILLIAMSON.