

(No Model.)

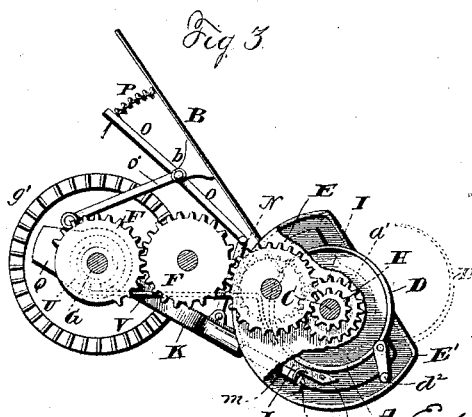
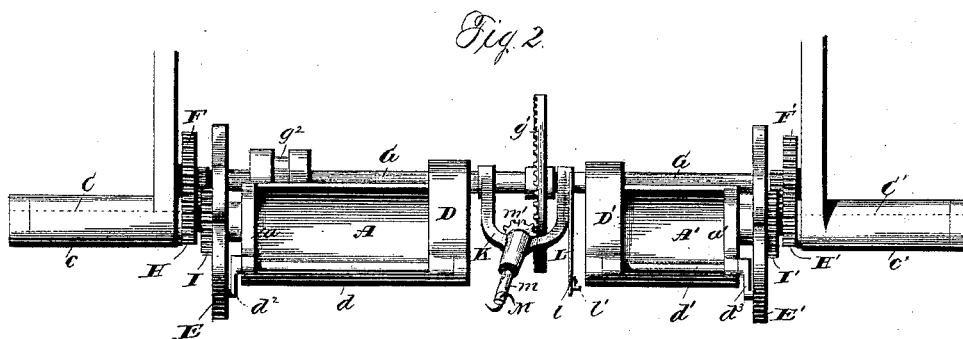
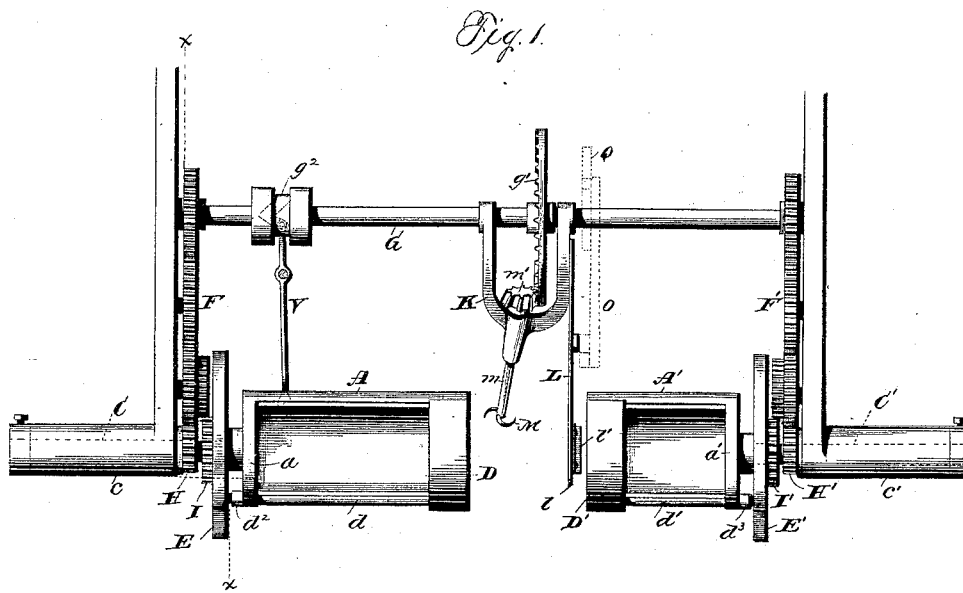
2 Sheets—Sheet 1.

E. HAWLEY & C. L. BARRETT.

GRAIN BINDER.

No. 419,945.

Patented Jan. 21, 1890.



Witnesses
Chas. Williamson
C. O. Davis

Inventors
Edward Hawley &
Charles L. Barrett
By C. M. Alexander

(No Model.)

2 Sheets—Sheet 2.

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Fig. 4.

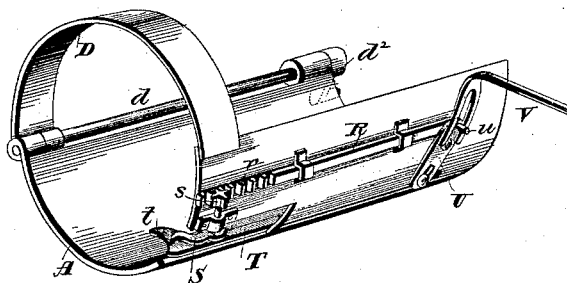


Fig. 5.

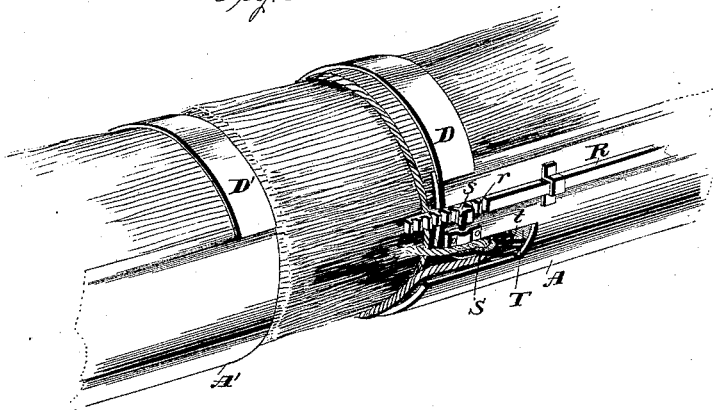


Fig. 6.

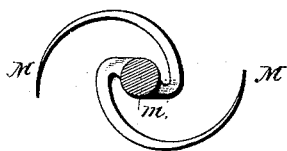
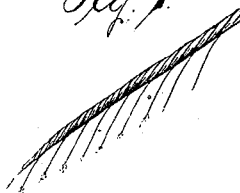


Fig. 7.



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UNITED STATES PATENT OFFICE.

EDWARD HAWLEY AND CHARLES L. BARRETT, OF ALLEGAN, MICHIGAN.

GRAIN-BINDER.

SPECIFICATION forming part of Letters Patent No. 419,945, dated January 21, 1890.

Application filed September 16, 1889. Serial No. 324,061. (No model.)

To all whom it may concern:

Be it known that we, EDWARD HAWLEY and CHARLES L. BARRETT, citizens of the United States, residing at Allegan, in the State of Michigan, have invented certain new and useful Improvements in Grain-Binders, of which the following is a specification, reference being had therein to the accompanying drawings.

Our invention has reference to the binding of grain, and more particularly to that mode of binding in which the band employed is composed of straw twisted or formed into a rope; and it has for its object the production of an apparatus for forming and applying the band to the sheaf or gavel, whereby the binding may be more securely done and generally better and more satisfactory results obtained than has been possible by the modes heretofore in vogue.

For the purpose of illustrating and describing our method we show in the accompanying drawings a form of apparatus which we have devised by which the various steps thereof may be successively and automatically carried on.

In such drawings, Figure 1 is a plan view. Fig. 2 is an elevation. Fig. 3 is a transverse section on line $x x$ of Fig. 1. Fig. 4 is a detail perspective view of one section of the sheaf-compressor we employ, taken from a point to show the device for securing the straw band in place after having been formed and placed around a sheaf. Fig. 5 is a similar view of the same parts in position to complete the binding process. Fig. 6 is a detail view of the straw-twisting hooks, and Fig. 7 is a view of a portion of twisted straw.

The mechanism we show is adapted for use in conjunction with any desirable form of self-binding reaping or harvesting machine, and may be attached to and operated therefrom as may be found expedient; but, as it is not essential to an understanding of its mode of operation, we have not shown any such machine. This mechanism consists, essentially, of a device for receiving and compressing the sheaf, a device for producing the straw rope, and a device for securely fasten-

ing such rope after it has been placed around the sheaf. In describing our apparatus we shall pursue this order.

As shown in the drawings, there are two semi-cylindrical compartments A and A', of unequal length, arranged axially in line with but separated by a space from each other, which constitute together a receptacle into which the grain, after being cut, may be delivered by any of the means usually employed for this purpose, that shown in the drawings being merely an elevated inclined table or platform B. At their outer opposite ends said compartments are provided each with heads a and a' , respectively, from the centers of which project outwardly shafts C and C' into suitably-supported elongated bearings c and c' , which permit of their rotation, and in consequence, also, that of the compartments A A', besides constituting means for supporting said compartments.

To effect the compression of the sheaf or gavel after its delivery and formation in the compartments A A' on the inner adjacent ends thereof, semicircular compressor-arms D and D' are mounted on rock-shafts d and d' , which are supported in bearings provided on the front or bundle-discharging side of said compartments, and along which they extend parallel with the axis of the compartments. Loosely mounted on the shafts C and C' between their bearings c and c' and the heads of the compressor-compartments, so as to revolve on but independently of them, are cams E and E', which engage crank-arms d^2 d'^2 upon the ends of the rock-shafts opposite to those carrying the compressor-arms, said cams and cranks operating together to cause the necessary movements of said compressor-arms to effect both the compression of the sheaf and to permit of its discharge after being bound. Duplicate trains of gearing F and F', driven from a shaft G and meshing with gears H and H' on the compressor-compartment shafts, are employed to effect the simultaneous and uniform rotation of said compartments; and rotation of the cams to operate the compressor-arms D and D' is accomplished through gears I and I', arranged

thereon and driven from the same trains of gearing F F', the relative diameters of the gears H H' and I I' being such that there are two revolutions of the compartments A A' to one of the cams E E', the purpose of all of such arrangements and operations being hereinafter set forth.

Any convenient means may be employed for rotating the driving-shaft G.

Having now described the mechanism for effecting the compression of the sheaf or bundle, we will now describe that shown for the production of the straw necessary for making the binding-band and for twisting it into "rope."

Mounted upon the shaft G is a yoke K, which is capable of a certain degree of oscillation thereon and carries on one of its arms a bar L, whose end constitutes a knife l, which has such position with relation to the compartments A A' as to extend into the space between them in proximity to the compartment A', and, when a sheaf of grain is therein, is adapted to engage with it at a point distant about one-third from the butt portion thereof and to cut into and sever the straw on the surface to a depth to be determined by the thickness of band desired. A plate l', projecting from the sides of the knife l, and preferably made adjustable, by its engagement with the surface of the sheaf limits the depth to which the knife can cut.

The twisting apparatus consists of two hooks M, of the shape shown best in Fig. 6, secured to the end of a shaft m at points diametrically opposite each other, which shaft has bearings in and is supported by the yoke K and has upon its opposite end a bevel-pinion m', meshing with a crown-gear g' on the driving-shaft G. As shown, this shaft extends downward and to one side, so that the twister-hooks are adjacent to the inner end of the compartment A and about on a level with the bottom thereof, in position to engage with and twist the straw as it is cut by the knife l. The operative positions of both the knife and twister are maintained by a bar N, connecting the yoke K to a lever O, pivoted at or about its center to the under side of the delivery-table at b and engaged at its other end by a spiral spring P, whose tension is sufficient to cause the knife to bear with such force against the sheaf of grain as is necessary to cut the straw. A cam Q, mounted on the shaft G, engaging with a bar O', rigidly attached to the lever O at its pivotal point, furnishes means for swinging the yoke so as to remove the knife and twister when desired away from the sheaf of grain. It will be observed that as the cam Q rotates the rear end of bar O' will be raised and the upper end of the lever O thrown forward against the action of the spring P, causing the lower end of lever O and rod N to move the yoke, with its cutter and twister, away from the bundle.

The mechanism for securing the band after its formation and passage around the sheaf is as follows: Arranged to slide longitudinally in suitable guides on the outside of the compartment A is a bar R, provided at one end with rack-teeth r, that engage with a pinion s on a vertically-arranged shaft having a bearing also on the side of the compartment A, which shaft carries a hook S, whose function is to co-operate with the hooked end of a second longitudinally-movable bar T, arranged on the inside of the compartment A, in securing the free end of the straw rope, as hereinafter specified. The bars R and T are arranged parallel to each other, and at contiguous ends are connected to a short rocking lever U, pivoted to the side of the compartment A nearer to its point of attachment to the bar R than to the bar T. From this lever U the longitudinal movements of the bars R and T are at the proper time effected, and by reason of the relative positions of their points of connection therewith the bar T has considerably more movement than the bar R. The lever U receives its movement from a lever V, having one end bifurcated and in engagement with a pin u, projecting from said bar U, and its other end in engagement with a cam g², secured to and rotating with the shaft G.

The operation of the mechanism shown and described is as follows: As has been before stated, the grain after being cut and conveyed to the table or platform B is discharged into the receptacle composed of the compartments A and A', with the head in the compartment A and the butt in A', the compressor-arms D D' at this stage of the operation being thrown open into the position shown in dotted lines. When a quantity sufficient to constitute a bundle or gavel of suitable size has been accumulated and packed by any of the devices usually employed for this purpose, the compressor-arms by the operation of the cams E E' and cranks d² d³ are caused to encircle the bundle, which is thus securely confined in place in the compartments A A', receiving its compression at two points. Immediately following the operation of the compressor-arms the yoke is swung upward, so as to bring the knife against the bundle and the twister into its operative position, said parts being held yieldingly in proper location with reference to the bundle by means of the spring P. As has been stated, the compartments A A' are of unequal length, that of the one A being such that the compressor-arm D thereof is approximately at the longitudinal center of the sheaf to be bound, while that of the one A' is such that its compressor-arm D' engages with the sheaf at a point about half-way between the compressor-arm D and the butt of the sheaf. The straw for forming the rope is used from that portion of the sheaf extending between said compressor-arms. Upon the coming into position of the knife and twister

the compartments A and A' and the bundle or sheaf therein, by means of the described trains of gearing, commence to revolve, and as the knife is caused to bear against the same
 5 at a point adjacent to the compressor-arm D' the surface straw will be severed to a depth to be determined by the thickness of the band or rope desired, which may be regulated by means of the adjusting-plate L', attached to
 10 the knife, said severing or cutting continuing during the revolution of the bundle, so that when said revolution has been completed the bundle of straw will be entirely circumscribed. Simultaneously with the rotation of the bundle and the severance of the straw by the
 15 knife the twister-hooks engage with the ends as they are produced at a point in proximity to the compressor-arm D and effect the necessary twisting into rope, such straw ends facilitating this engagement by springing outward from the body of the sheaf or bundle by reason of the compression by the said compressor-arm D. Owing to the peculiar
 20 curvature of the twister-hooks the straw as it is being formed into band or rope will be quite tightly engaged thereby, so that in consequence there will be produced tension enough to insure the close wrapping of the bundle by it. The band thus formed
 30 is integral with the bundle it serves to bind, and is secured in place to prevent its untwisting by forming more than is needed to just encircle it by causing the bundle to make a second rotation, which excess is caught by the hook S, (whose position
 35 until this point in the operation has been reached is one lying across the band a few inches from the point where it was commenced, being placed there shortly after the twister has begun its work,) which is rotated
 40 for the purpose by the rack-bar R and pinion, and said band is passed across itself in a line parallel with the axis of the bundle, and then is again engaged by the hooked end t of the
 45 bar T, and by its movement passed or tucked under itself and into the body of the bundle, the revolution of the bundle ceasing long enough for this purpose by reason of the provision on the driving-shaft G of a mutilated
 50 gear-wheel, as shown. Upon the completion of this operation the swinging yoke is operated so as to remove the knife and twister away from the bundle, and the compressor-compartments then complete their second
 55 revolution and arrange themselves into position to permit the bundle to be ejected or removed from them, the compressor-operating cams having in the meanwhile rotated just half as rapidly, completing their rotation
 60 simultaneously with said compartment and throwing open the compressor-arms to position to allow the exit of the bundle and the entrance of another quantity of grain for a repetition of the operation just described.
 65 After the band has been formed around the bundle, and at the point where it begins to

lap or form the excess, the straw which is being twisted to make the lap or excess interlocks with the straw of the band just formed and unites with it in the process of twisting,
 70 thus forming a continuous band around the bundle, the only object of tucking the last-formed portion under the band into the bundle being to prevent its untwisting and the more effectually to secure it in place, as above
 75 stated.

By our process and apparatus grain can be most expeditiously bound, as the formation of the band is simultaneous with its application to the bundle, and by reason of the
 80 fact that it is integral therewith its accidental removal and the falling to pieces of the sheaf or gavel are impossible.

It is to be observed that the place at which the straw is cut and afterward applied to the
 85 bundle is such that only the "butt" portions of the severed straw are lost, and that in no manner are the head ends disturbed or damaged.

Having described our invention, what we
 90 claim is—

1. The combination of a rotatable bundle-receptacle provided with compressing devices, a knife held against the bundle at a point between its ends, and a twister arranged in close
 95 proximity to the bundle and adapted to twist the straw cut into a band as the bundle revolves, substantially as described.

2. The combination of a rotatable bundle-receptacle, a knife held yieldingly against the
 100 bundle at a point between its ends, and a twister arranged to twist the straw cut by the knife, substantially as described.

3. The combination of a rotatable bundle-receptacle, a swinging yoke or frame K, carrying a twister and knife, and means for
 105 automatically throwing this yoke toward and from the bundle, as and for the purpose set forth.

4. The combination, with a rotatable bundle-receptacle and twister, of a reciprocating
 110 hook t, a rotating hook S, and means for operating these hooks simultaneously, as and for the purposes set forth.

5. The combination, with a rotatable bundle-receptacle and twister, of a reciprocating
 115 hooked bar T, a rotatable hook S, secured to a shaft provided with a pinion s, a rack-bar R, for rotating the hook S, and means for simultaneously reciprocating bars T and R, substantially as and for the purpose set forth.
 120

6. The combination, with a rotatable bundle-receptacle constructed of two separated compartments, of a compressor upon each compartment, an adjustable knife held against
 125 the bundle near the inner end of one of these compartments, and a twister arranged in close proximity to the inner end of the other compartment, as and for the purposes set forth.

7. The combination of a rotatable bundle-receptacle constructed of two separated compartments, a knife and twister adapted to
 130

operate upon the bundle between these compartments; a compressor-arm on the inner end of each of these compartments, rock-shafts provided with cranks d^2 d^3 and secured to said compressor-arms, cams engaging the said crank-arms, and means for rotating these cams and the bundle-receptacle simultaneously, substantially as described.

In testimony whereof we affix our signatures in presence of two witnesses.

EDWARD HAWLEY.
CHARLES L. BARRETT.

Witnesses:

E. REESE,
WILLIAM C. WALTER.