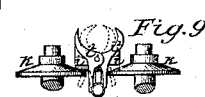
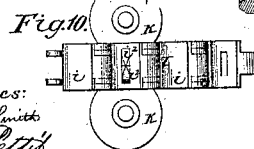
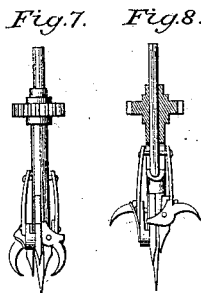
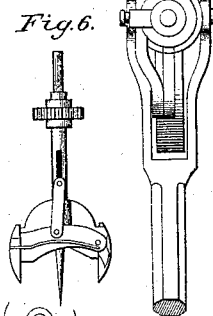
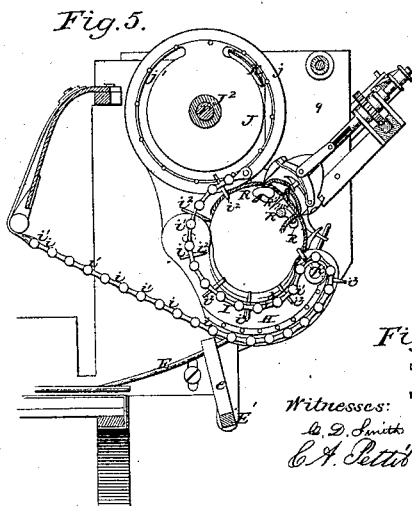
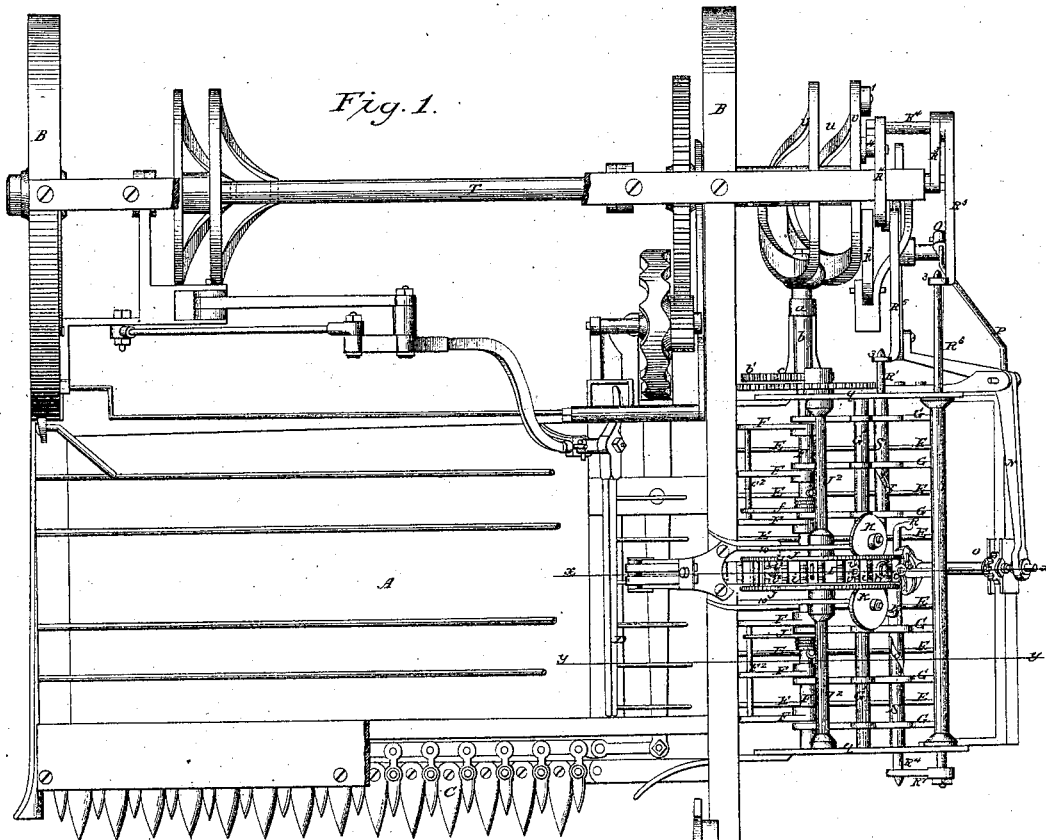


W. F. GOODWIN.

Grain Binder.

No. 53,138.

Patented March 13, 1866.



Witnesses:
W. D. Smith
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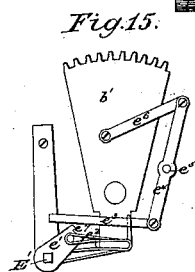
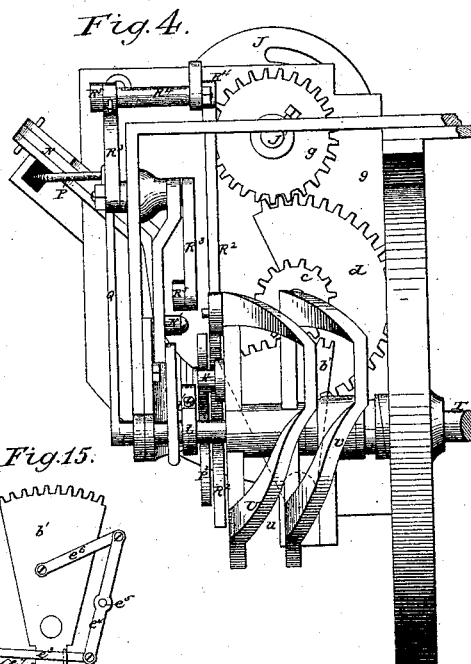
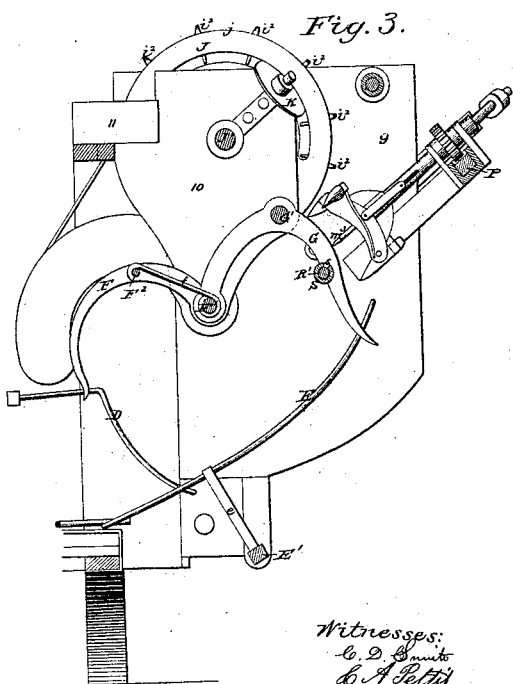
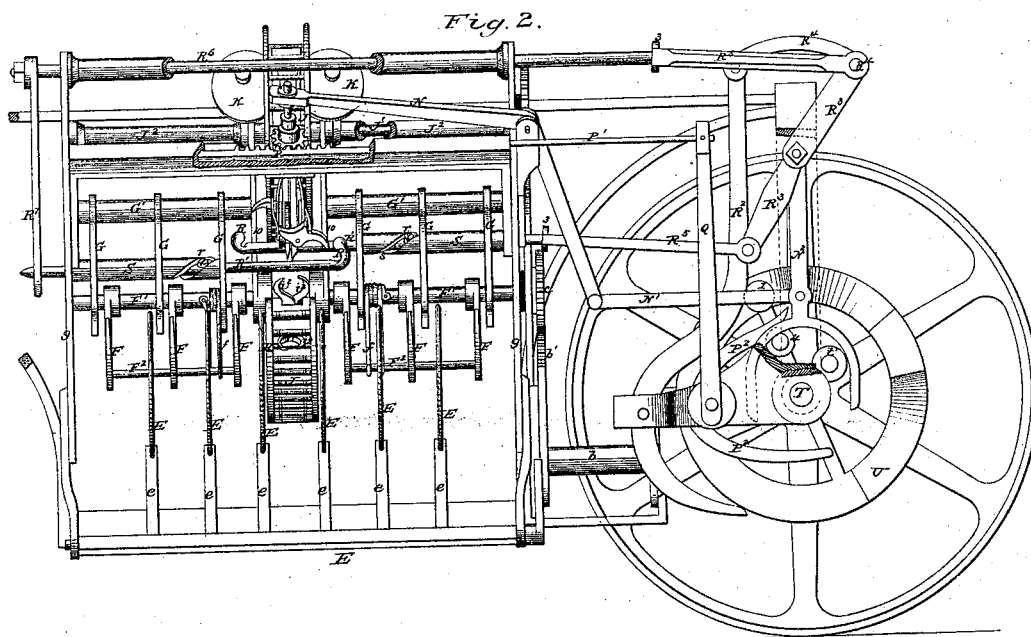
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Fig. 11.

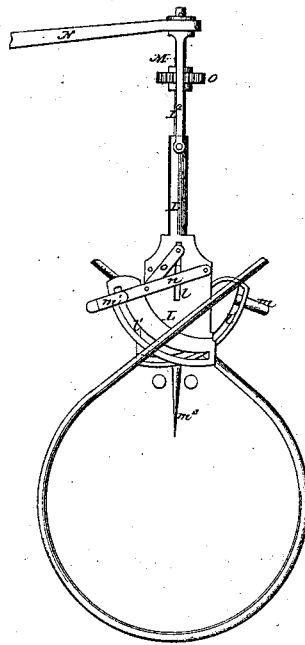


Fig. 12.

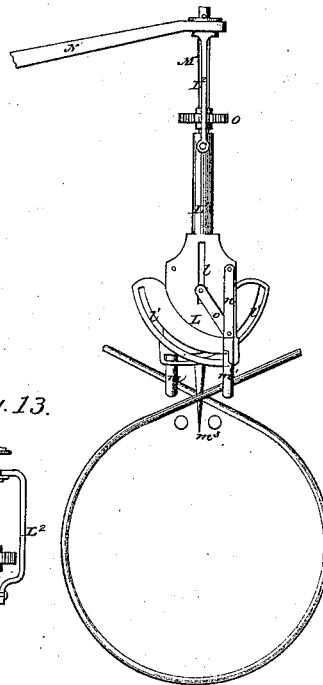
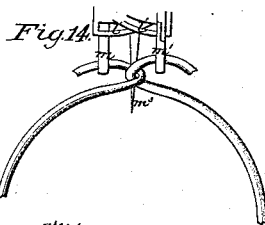
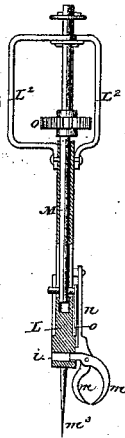


Fig. 13.



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UNITED STATES PATENT OFFICE.

WILLIAM F. GOODWIN, OF WASHINGTON, DISTRICT OF COLUMBIA.

IMPROVEMENT IN GRAIN-BINDERS.

Specification forming part of Letters Patent No. 53,138, dated March 13, 1866.

To all whom it may concern :

Be it known that I, WILLIAM F. GOODWIN, of the city and county of Washington, in the District of Columbia, have invented a new and Improved Machine for Binding Grain; and I do hereby declare the following to be a full, clear, and exact description of the nature, construction, and operation of the same, reference being had to the accompanying drawings, which are made a part of this specification, and in which—

Figure 1 is a plan of my improved grain-binder as attached to a harvester, the two being intended to operate in conjunction. Fig. 2 is a side elevation of the same. Fig. 3 is a vertical section through the binding apparatus, the plane of section being indicated by the line *yy*, Fig. 1. Fig. 4 is a rear-end elevation of the binding apparatus. Fig. 5 is a vertical section through the binding apparatus, the line *xx*, Fig. 1, indicating the plane of section. Figs. 6, 7, 8, 9, 10, 11, 12, 13, 14, and 15 are detached views of the several operating parts, which, in connection with their respective functions, will be referred to in the course of the ensuing description.

Similar letters of reference denote corresponding parts in all the figures.

This invention relates to mechanism which is attached to and travels with a harvester, and serves to form the grain into gavels, bind it into sheaves, and deposit them in succession upon the ground.

The grain is swept to one side of the platform by a transversely-moving rake, and being placed in a convenient position by the latter, it is caught by a series of curved vibrating fingers, in which it assumes the form of a gavel, and is made compact by the embrace of two sets of such fingers. A band of straw is carried around the gavel thus formed by a flexible carrier of peculiar construction. The ends of the band are seized and passed around each other by clutching devices, and then drawn under the band by tucking-hooks, in such a way as to form an effective knot, and thus make the sheaf complete, which is released by the embracing-fingers and permitted to fall to the ground.

The following description will enable others skilled in the art to which my invention appertains to fully understand and use the same.

In the accompanying drawings, A may represent the platform of a harvester, B the carrying-wheels, C the cutting apparatus, and D the rake. The movement of the rake is from side to side, instead of from front to back. The framing is continued or extended at one side of the machine for the attachment and support of the binding apparatus. The means here represented for giving the described movement to the rake need no specific description in this specification, as they form the subject of a separate application by myself, and have no essential connection with the binding mechanism.

The rake at each stroke sweeps the grain to one side of the platform in the requisite quantity to form a sheaf, and leaves it at the edge of the platform, where it is retained by a device which I will term a "cradle," E, which consists of a series of curved parallel fingers, which are fixed independently to upright arms *e*, attached to a shaft, *E'*, which is journaled in suitable bearings, so as to be free to turn and thereby vibrate the cradle.

F F represent a series of vibrating fingers fixed loosely upon shafts *F'*, but made to turn therewith by means of the springs *f*, which, at one end, are coiled around the shafts *F'*, their other ends being attached to the bars *F''*, which lie transversely upon the fingers F and cause them to move together, at a sufficient distance in advance of the band-carrying arm H to allow the band to pass round the gavel without coming in contact with the straw till the gavel has been compressed between fingers F F and G G, and the band has advanced sufficiently to encircle the gavel, when the springs yield and allow the arm H to move up against the gavel, pressing the band tightly around it.

G G represent a corresponding series of stationary fingers, which are mounted upon stationary shafts or supporting-bars *G'* above the fingers F. The shafts *G'* form the exclusive support of the fingers G; but the inner ends of the latter are formed with bosses, through which pass the shafts *F'*, and in which said shafts may be supported, though other means for supporting them may be adopted, if preferred.

I shall continue the description of the gaveling and binding mechanism, and speak of the motions of the several parts irrespective

of the devices through which motion is imparted to them, and treat of the driving mechanism in the subsequent description.

I have described the fingers whereby the grain to be bound is gathered and compressed into the form of a gavel. Next in the course of the description will follow the device which carries the band around the gavel, then the device which turns the ends of the band, and then the means for tucking and drawing the ends of the band to complete the binding operation.

H represents a hollow vibrating arm, attached at the respective ends of the shafts F^1 F^1 , and receiving motion from the latter. This arm is of such form and is arranged in such a manner that when the fingers F have risen and compressed the gavel between themselves and the stationary fingers G, said arm extends beneath and partially around the gavel, and the carrier I, which is moved by the arm H, assumes a similar position relatively to the gavel.

The construction of the carrier I and the manner in which it operates will be understood by reference to Figs. 5 and 10. It consists of a number of plates, i , and rollers i^1 , joined together so as to form a flexible chain or belt, that portion of it which circumscribes the gavel being supported within the arm H, or between its two sides, by means of the flanges h , which terminate at suitable points to allow the carrier or chain I to extend to its points of attachment, or, in other words, to permit the chain to move upon the arm H, and between the latter and the points to which the extremities of the carrier are attached. One extremity of the carrier I is attached to a wheel, J, while the other end may be attached to a stationary part of the machine, or to the wheel to which its other end is fastened, both arrangements being equally well adapted for the purpose. The wheel J is mounted upon a shaft, J^1 , from which it derives a rotary, intermittent, and reciprocating motion, allowing the carrier to run off its periphery when the arm is being advanced toward the gavel, and taking up the carrier when the arm is retracted. The carrier I, in moving upon the wheel J, is guided and held in place by means of the flanges j , and supported upon internal flanges j' .

K K represent disks or rollers, which project through the face of the wheel J from opposite sides and occupy positions beneath its rim. These disks act upon claws or fingers i^2 , which are pivoted together and within the plates i , as seen in Fig. 9. When the arm H is retracted and the carrier I extends over the upper portion of the periphery of the wheel J, the claws i^2 are opened successively by their lower extremities coming in contact with the disks K, and the band is laid between the open claws by an attendant. The band, being grasped by one pair of claws, is carried around and caught by the claws, which take hold of it one after another, till it is properly confined

upon the carrier I. The carrier continues to advance until it assumes a position in which the band will partially surround the gavel within the fingers F and G, with its ends so presented that they may be caught by the clutches; for which purpose the claws which hold the outer end of the band are made to let go of the same by coming in contact with the rollers h^2 h^2 in the arm H, a sufficient portion of the band being thus released to admit of the grasp of the turning mechanism. The springs f act to hold the fingers F in advance of the arm H when the gavel is in the fingers and the arm is moved forward to apply the band; but when the advancing motion of the fingers ceases, the springs allow them to yield or give in order that the arm may move snugly up against the gavel and carry the band with it. Hence, when the arm and fingers are retracted the springs keep the fingers against the gavel till the arm has entirely receded therefrom, and by thus sustaining the band the fingers cause the claws i^2 to disengage themselves from the band.

The device shown in Figs. 6, 7, and 8 is capable of performing the operation of turning and interlocking the ends of the band; but the device which I prefer for this office and wish to claim especially is shown in Figs. 11, 12, 13, and 14, in which m m^1 m m^1 represent two pairs of jaws, which are attached to a plate, L, from which extends a sleeve, L^1 , which is attached by links L^2 L^2 to a vibrating lever, N, which moves the sleeve L^1 and plate L up and down alternately, for the purpose to be explained. A rod, M, passes down through the sleeve and plate, and carries at its lower end a needle or analogous pointed device, m^3 , which penetrates the gavel and constitutes a center, about which the clutches m m^1 revolve in turning or crossing the ends of the band. Each jaw m is attached to an arm, n , which is pivoted at its upper extremity to the plate L, and connected at an intermediate point to a link, o , which is pivoted to the rod M by a pin, which passes through a slot, l , in the plate L, the effect of which is, that when the plate rises the link o , being made to approach a vertical position, acts upon the arm n , so as to cause it to vibrate in a circle about its pivotal point on the plate. Each jaw m^1 is pivoted to one of the jaws m , and formed with a projection which works in a slot, l , of the plate L, said slot being eccentric relatively to the pivotal point of the arm n . Hence, when the plate L is lowered by the lever N the effect is to elevate the clutches m m^1 m m^1 by means of their respective links, pins, and grooves, and cause said clutches to open, ready to receive the ends of the band. At the same time the plate assumes a position which causes the ends of the band to cross, one on each side of the plate, under the jaws which are to grasp them, thus preventing the tangling of the ends of the band, as shown in Fig. 11. The elevation of the plate lowers the clutches and closes them, so as to cause them to grasp the ends of the band

which is around the gavel and in readiness to be tied, the plate assuming a position sufficiently high to allow the tucking-hooks to pass under it when in the act of taking the ends of the band from the jaws, as shown in Fig. 12. When the parts are in the condition last mentioned the rod M receives a partial rotary motion from a pinion, O, which meshes with a rack, P, on the end of a rod, P¹, which is moved longitudinally by the oscillating arm Q.

By these several motions *m m*¹ are made to grasp the ends of the band at a point some distance from their extremities, or, at least, in close proximity to the clutches *i*² of the carrier I, and they then move toward the end of the band, so that before the crossing or turning of the latter commences, the straw at the end of the band is confined within and fully controlled by the clutches, whereby the band is the better adapted to be securely tied.

The crossing of the ends of the band having been effected, as shown in Figs. 11, 12, and 14, it remains to tuck under and draw out the ends of the band to complete the knot. This is effected by means of the tucking-hooks R R, which are formed upon the ends of rods R¹ R¹, which slide within the sleeves S S. These sleeves S S have serpentine slots or grooves *s s*, in which play the pins *r r* in the rods R¹ R¹, so that as the rods are retracted or advanced they undergo a partial rotary movement. The hooks R R are in an advanced position and under the band at the stage of the operation at which the ends of the band are crossed by the clutching devices, and after this latter operation has been performed they are retracted, moving toward the front and rear from points on the opposite sides of the center of the gavel, respectively. In being thus retracted, the hooks R take hold of the ends of the band, and carry them under the body of the band at each side of the knot, and they are enabled to hold the band and draw it up tightly by the rotary movement which they receive in traversing the interior of the sleeves S S.

After the hooks R R have performed their function they continue to recede from the band until they are entirely clear of the ends, so as to present no obstruction to the passage of sheaf from the binder. If preferred, the serpentine slots may be made in the rods R¹, which can be made to turn by pins projecting from the sleeves S.

As soon as the gavel has been bound the fingers F move from beneath the same, and assume a proper position from which to take another gavel from the cradle E, in doing which the fingers F pass between the fingers of the cradle E and the tines of the rake. The sheaf, now released from the fingers F, is supported upon the cradle E, which is tilted to one side of the machine, and deposits the sheaf upon the ground.

The main axle T is extended outward at the binding side of the machine, where it carries a cam-wheel, V V, consisting of two rims hav-

ing an intermediate cam-groove, *u*, in which works the end of a bent arm, *a*, on a shaft, *b*, which carries a toothed segment, *b'*, which gears with a pinion, *c*, on one of the shafts F¹. The end of the arm *a* which plays in the groove *u* is armed with a roller, *a'*, to avoid friction. The shaft F¹, which carries the pinion *c*, also has upon it a semicircular rack, *d*, which imparts motion to the pinion *g* upon the shaft J¹, upon which the wheel J is mounted. Said shaft J¹ is inclosed within the tubular braces or sleeves J² J², which, in addition to retaining the several parts of the binder-frame in proper position, cover the journals of the shaft J¹, and prevent the straw from interfering therewith. The gearing *b' c d g* is proportioned as to relative size with a view to give a somewhat faster motion to the shaft J¹ than to the shafts F¹ F¹, the wheel J requiring a more rapid motion than the fingers F.

The cam-wheel V has upon the face of one of its rims a roller, 1, which, at the proper moment, strikes and vibrates an arm, R², which, at its bend, is pivoted to a stationary part of the binder-frame. The same roller, striking the lower end of said arm, causes it to resume its previous position. The upper end of the arm R² is connected to a double-crank shaft, R³, by means of the connecting-rods R⁴ R⁴. R⁵ R⁵ represent rods which connect the ends of the crank-shaft R³ to the tucking-rods R¹ R¹, and communicate the previously-described motion thereto. A direct connection is made between the lower rods R⁵ and its tucking-rod R¹; but the other tucking-rod being at the farther side of the binder renders necessary the employment of the intermediate connections R⁶ and R⁷ between said tucking-rod and the upper connecting-rod R⁵. Both rods R⁵ R⁵ are provided with hooks 3 3 at their forward ends, which engage over suitable enlargements on the rods to which they are connected, and make them susceptible of being readily thrown out of connection when necessary.

N¹ represents a rod which connects the vibrating lever N to a swinging arm, N², which is forked at its lower end, and receives motion from a projection, *t*, and roller *t'*, attached to, and rotating with, the main axle T.

The oscillating arm Q, which operates the rack P, is attached to a short shaft, which is secured to an elbow or fork, P², which is acted upon by a roller, 4, journaled upon a stud which projects from the cam-wheel, V.

The motion of the shaft E' of the cradle E is effected by the following device: *e*¹, Fig. 15, represents an arm which projects at right angles from the end of the shaft E', and is attached to a stationary part of the binding-frame by an elastic band or spring, *e*², which has a tendency to draw the upper end of the arm *e*¹ inward, and thus hold the cradle in proper position to receive the gavel from the platform and support it when it becomes a sheaf. *e*³ is an arm pivoted to one end of a lever, *e*⁴, which rocks upon a stud, *e*⁵, project-

ing from the binding-frame. A link, e^6 , connects the lever e^4 to the segment b' , so that when the segment is in motion the arm e^3 is projected outward and forced against the arm e^1 on the shaft E' , which is thereby caused to turn and tilt the cradle E , in the manner previously described, for the purpose of dumping the bound sheaf. The arm e^1 is formed with a protuberance, e^7 , which guides the outer end of the arm e^3 , and ultimately causes it to pass over the top of the arm e^1 , which occurs when the cradle has been tilted to a sufficient extent to dump the sheaf. The arm e^3 is retracted as well as projected by the vibratory movement of the segment b' , and when said arm e^3 ceases to act upon the arm e^1 by passing over the same, the arm e^1 is retracted and the cradle returned to its normal position by the spring or elastic band e^2 .

In the plan view, Fig. 1, 9 9 represent the end-boards or frame-work which secures and supports the several parts of the binding apparatus, and by which, in connection with the central frame 10 10, the binder is attached to a reaping-machine, and form end-boards which prevent the grain from falling off or scattering at the ends. The said frame is braced and held together by a series of hollow tubes or shafts. The braces are hollow to allow the operating-shafts to pass through and move in them, and also to secure lightness of material. In a full-sized working machine it will be necessary to have a frame-work sufficiently strong to receive and support the shafts, the inner parts being lined with sheet-iron or light wood to prevent the grain from falling off at the ends. The said frame forms the support for a box to contain straw for bands, and also supports the seats for the driver and the attendant of the binder.

10 10 is a fixed frame placed at the center, between the end boards or pieces 9 9, and is held in position and supported by the hollow braces or shafts $J^2 J^2 G' G'$ and lugs or projections 11 11. The frame 10 supports the inner ends of the shafts F^1 , which pass through holes in the lower part of said frame, and enter corresponding holes in the swinging arm H , and are securely fastened to said arm, said frame forming the bearing and support for said arm. Said frame also supports the chain-bearing wheel J and rollers or disks $K K$. By using a plurality of wheels, such as J , the carrier I may be made to occupy a straight horizontal position at the point where it receives the band.

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

1. The vibrating fingers F , fixed upon the shafts F^1 of carrier H and made to move therewith by means of the springs f and bars F^2 , substantially as and for the purpose herein specified.

2. In combination with the above, the series of stationary fingers G and shafts or support-

ing-bars G' , said stationary fingers acting in conjunction with the vibrating fingers F , to form and compress the gavel, substantially as described.

3. The arm H , in combination with the circulating chain or carrier I and wheel J , said devices acting together in the manner described, for the purpose of placing the band around the gavel.

4. The carrier I , composed of the plates i , rollers i^1 , and claws or fingers i^2 , as described.

5. The disks or rollers K , which act on the claws i^2 , so as to cause them to open and receive the band when the carrier is in position to take it, substantially as described.

6. Constructing the arm H with the flanges h , which afford a bearing for the carrier I as it traverses said arm, substantially as set forth.

7. The wheel J , formed into flanges $j j'$, and employed to take up, let out, and guide the carrier I in its movements, substantially as described.

8. The rollers $h^3 h^3$ in the end of the arm H , which causes the outer claws $i^2 i^2$ to release the end of the band to be grasped by the turning or crossing devices, as described.

9. The two pairs of jaws $m m^1 m m^1$, adapted to grasp the ends of the band separately and pass one around the other so as to interlock them, substantially as described.

10. The hooked rods $R^1 R^1$, adapted, after the band has been passed around them, to seize its interlocked ends and draw them beneath the band, substantially as explained.

11. The combination, with the hooked rods $R^1 R^1$, of the sleeves $S S$, grooves or slots $s s$, and pins $r r$, for imparting a rotary movement to the hooks, as and for the purpose specified.

12. The combination, with the clutches $m m^1$ of the plate L , sleeve L^1 , rod M , pivot-arm n , link o , and slot l , all arranged to operate substantially as described.

13. The combination, with the above, of the vibrating lever N , connecting-rod N^1 , swinging arm N , and projection t , through which the requisite vertical movement is transmitted from the main axle T to the clutching devices.

14. The cradle E , arranged at one side of the platform to receive the grain from the rake and conduct it to the stationary fingers G , and permit the fingers F to pass under and raise the grain for the purpose of forming the gavel, as described.

15. The arrangement of the cam-wheel V , bent arm a , shaft b , toothed segment b' , pinion c , rack d , and pinion g , for operating the shafts F^1 and J^1 .

16. The reciprocating arm e^3 , in combination with the projection e^1 , protuberance e^7 , and spring e^2 , for operating the cradle E .

17. The combination of the pinion O , rack P , rod P^1 , oscillating arm Q , elbow or fork P^2 , and roller 4 on the cam-wheel V , said parts operating to give the requisite rotary movement to the devices which clutch and turn the ends of the band.

18. In combination with the hooked rods R¹, the vibrating arm R², which is operated by the roller 1 on the cam-wheel, and connected with the rods R¹ by the rods R⁴ R⁵ R⁶ R⁷ and double-crank shaft R³.

19. The connecting-rods R⁵, formed with hooked ends 3 3, to permit them to be readily disengaged, as and for the purpose set forth.

20. The binder-frame 9 9 10 10, braced by means of the tubular shafts, as herein described.

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Witnesses:

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OCTAVIUS KNIGHT.