(No Model.)

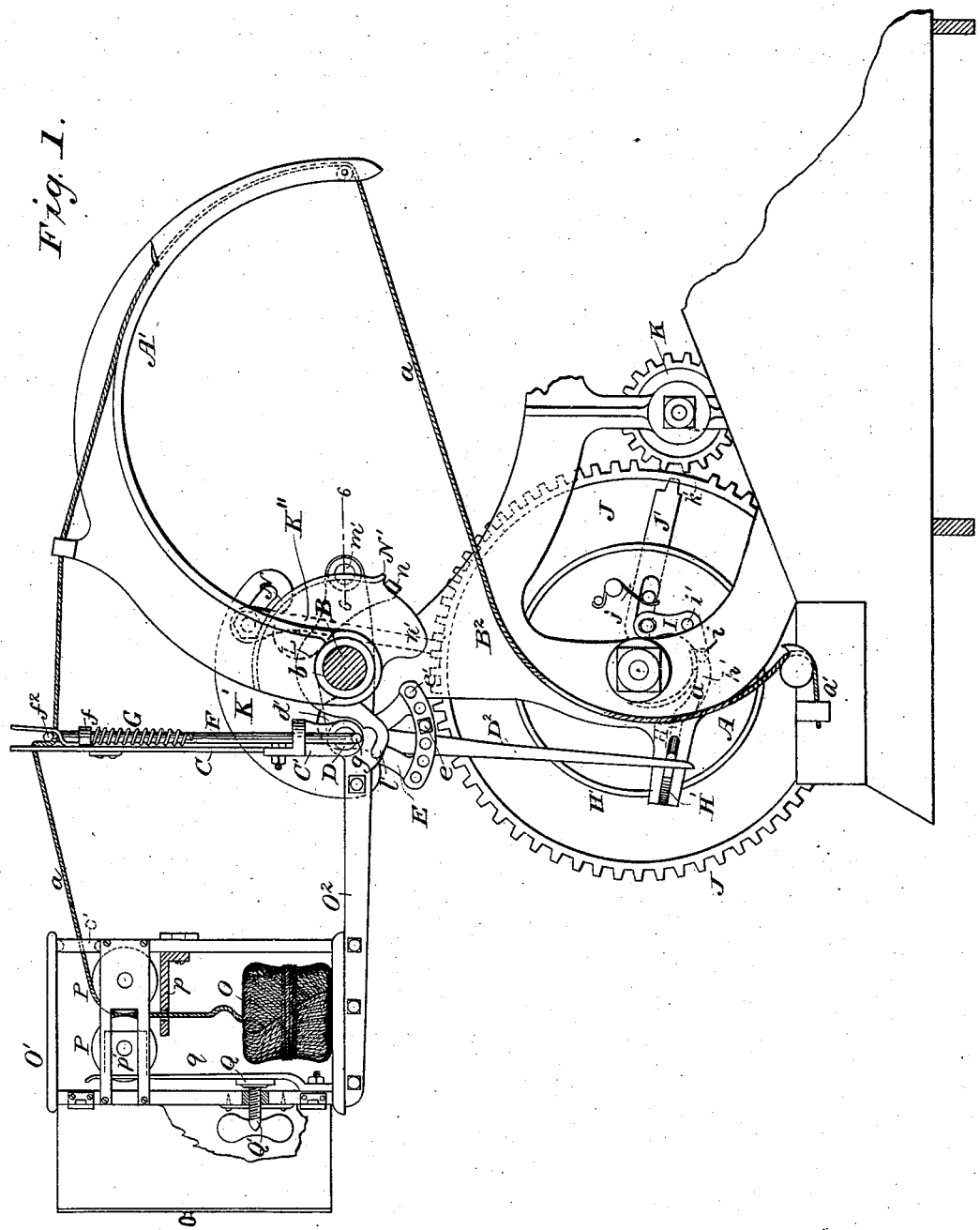
3 Sheets—Sheet 1.

J. S. DAVIS.

GRAIN BINDER.

No. 261,590. Patented July 25, 1882.

Fig. 1.



WITNESSES

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(No Model.) 3 Sheets—Sheet 2.

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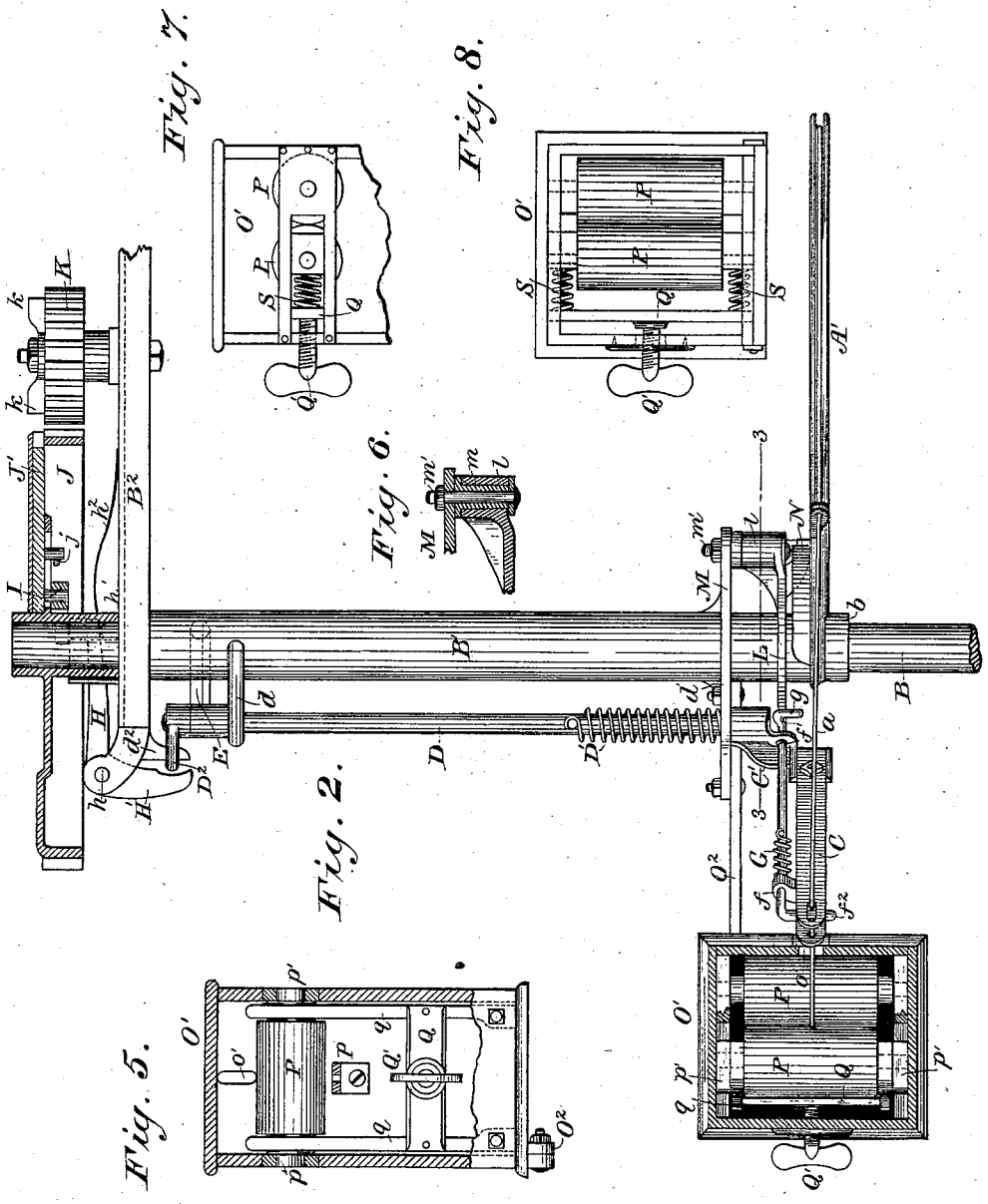

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(No Model.) 3 Sheets—Sheet 3.

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Fig 4.

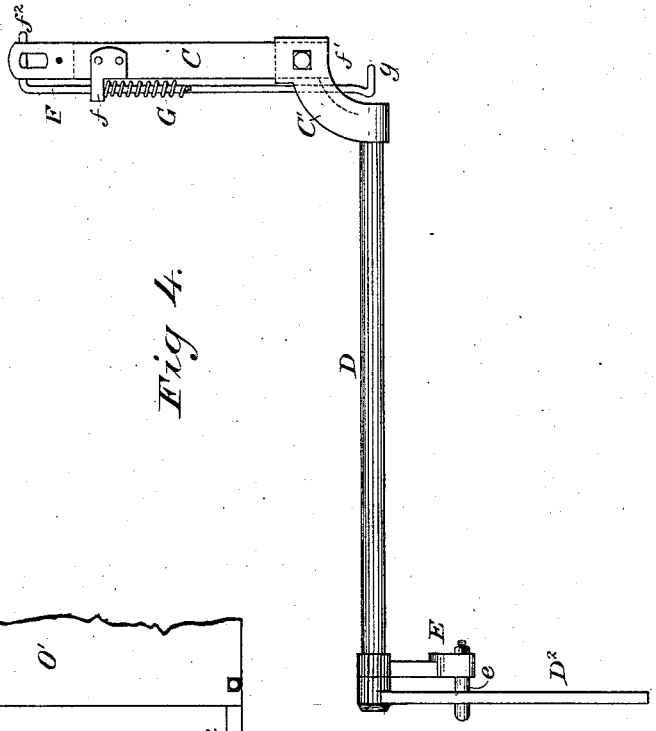
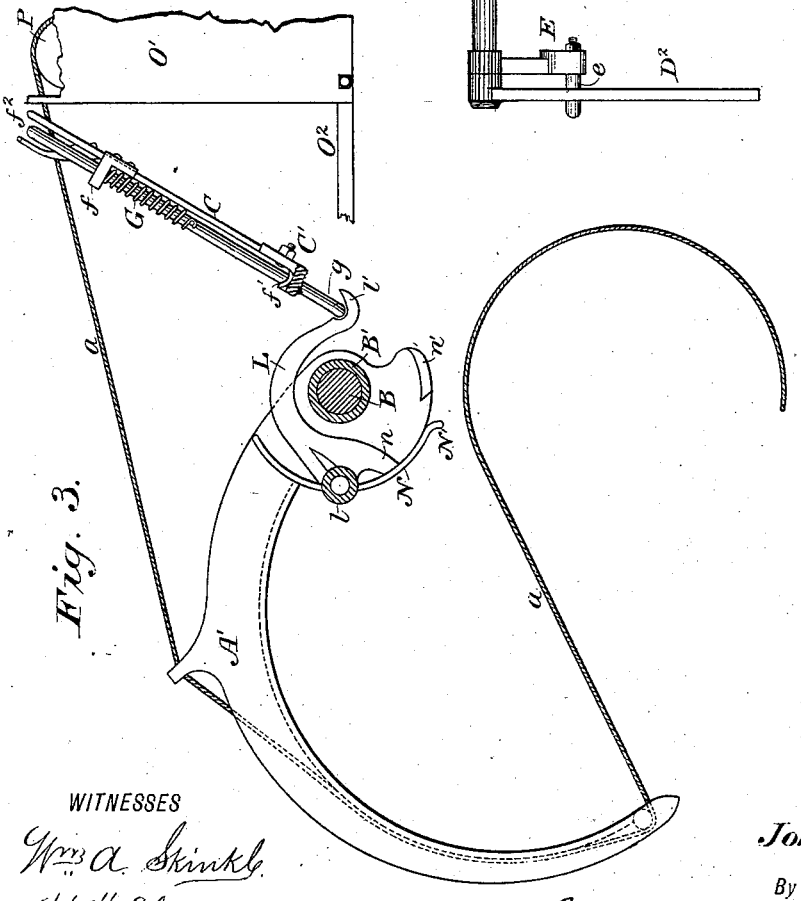


Fig. 3.



WITNESSES

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UNITED STATES PATENT OFFICE.

JOHN S. DAVIS, OF TOLEDO, OHIO, ASSIGNOR TO THE TOLEDO MOWER AND REAPER COMPANY, OF SAME PLACE.

GRAIN-BINDER.

SPECIFICATION forming part of Letters Patent No. 261,590, dated July 25, 1882.

Application filed February 1, 1882. (No model.)

To all whom it may concern:

Be it known that I, JOHN S. DAVIS, of Toledo, in the county of Lucas and State of Ohio, have invented certain new and useful Improvements in Grain-Binders, of which the following is a specification.

My invention chiefly relates to improvements in grain-binders of the class in which binding mechanism is automatically thrown in action by the strain upon the binding material of the grain as it is accumulated in gavels.

My invention also relates to certain improvements in mechanism for supplying the binding material under tension.

The subject-matter deemed novel will hereinafter be distinctly claimed.

The accompanying drawings show a suitable organization of mechanism in accordance with my invention especially adapted for use in connection with a grain-binder such in many features of construction as shown and described in my application for United States Letters Patent filed April 23, 1881, and entitled "Improvements in Grain-Binding Mechanism." Only such parts of a fully-organized grain-binding machine are shown as are deemed requisite to an adequate illustration of the preferred adaptation of the various improvements constituting my invention.

My improvements, in whole or in part, may be ingrafted upon machines differing more or less from that shown in my above-mentioned application.

Figure 1 is a side elevation, with some parts broken away and others in section, the positions in which the parts are shown being those occupied while the grain is accumulating against the binding material as it is supplied under tension in limited quantity. Fig. 2 is a plan or top view, with parts in section. Fig. 3 is a view partly in side elevation and partly in section on the line 3 3 of Fig. 2, the parts shown being represented in the positions occupied by them shortly after the binding mechanism has been set in motion and the binder-arm commenced its descent. Fig. 4 is a view in elevation of the rock-shaft and attachments thereof, by the actuations of which the binding mechanism is thrown into operation by strain on the binding material. Fig. 5 is a view, partly in elevation and partly in section, of apparatus for supplying the binding material under tension. Fig. 6 is a section, as indicated by the line 6 6 of Fig. 1, showing in detail the manner of supporting a tripper which is actuated by an attachment of the binder-arm to release the binding material from the rocking clamp by which it is held until after the binding mechanism is thrown into action and the binder-arm commences its movement. Fig. 7 is a view of a portion of the twine-holding box with one side removed, showing a slight modification of the tension apparatus; and Fig. 8, a plan of the same with the box-top removed.

As my present improvements are in this instance shown as organized for use in connection with a machine similar in many respects to that embracing prior improvements of my invention as set forth in my before-mentioned application, particular reference is hereby made to said application for illustration and description of such mechanism not hereinafter specified or in detail described as may be required to convey a proper understanding of my improvements as adapted for operation in connection with all essential features of a suitable grain-binding machine.

The grain is forced or delivered under pressure to a binding-receptacle at A and against the binding material *a*, the end of which is properly held, as at *a'*, in suitable position relatively to knotting and severing mechanism.

A binder-arm, A', is fixed, as by a sleeve, *b*, and set-screw, to a rock-shaft, B, mounted to oscillate in a long bearing or tubular frame-support, B', connecting at one end with the standard or upright portion B^2 of the frame.

The binding material is supplied under suitable tension to the binder-arm, being first passed through a rocking cord-clasper or oscillating arm for holding and releasing the binding material, to be fully described farther on. The binding material shown as employed in this instance is cord; but wire may, if preferred, be employed in accordance with my invention in connection with any suitable mechanism for supplying it under tension and for twisting and severing the band ends.

The oscillating cord-clasper or rocking arm

for holding and releasing the binding material, and by the range of movement allowed which the sizes of gavels may be determined, is, as in this instance shown, constructed and adapted for operation in connection with mechanism for throwing the binding mechanism into and out of action, as now to be explained.

The rocking arm proper, main member, or lever C of the clasper is fixedly connected at its inner or heel end to a rock-shaft, D, arranged close to and parallel with the binder-arm rock-shaft B.

An angular bracket, C′, serves to connect the clasper-lever and rock-shaft D, the bracket being provided at one end with a sleeve or socket, by which it may be secured in suitable way, as by a set-screw, to the inner end of the rock-shaft, and the lever C being secured by a bolt in a seat in the other end of the bracket so as to project at a right angle to the rock-shaft and in or about the vertical plane of the binder-arm A′.

The rock-shaft D is mounted near its ends so as to oscillate in bearings shown as formed by lugs or brackets *d d′* of the tubular frame-support B′.

A torsional spring, D′, secured at one end to the rock-shaft D and at the other to the supporting-lug *d′*, acts constantly with a tendency to oscillate the rock-shaft in a direction such as to rock the upper end of the lever C away from the binder-arm and into the position in which it is represented in Figs. 2 and 3, or else to hold the lever in such position.

A pendent trip-arm or tappet-rod, D^2, is loosely supported upon the outer end of the rock-shaft D, and normally rests near its lower end against or close to a stop, d^2, on the frame B^2.

A downwardly-projecting perforated bracket or segment, E, is fixedly attached to the rock-shaft D between its bearing *d* and the arm D^2.

A stud or short pin, *e*, is secured in any one of the series of holes *e′* in the bracket E by means of a nut fitted to the reduced threaded end of the pin which passes through the selected hole. This pin projects by the side of and beyond the tappet D^2, and serves to impart to it an oscillating movement with the rock-shaft D during a portion of the movement of this rock-shaft, for a purpose farther on to be explained.

The movement of oscillation of the rock-shaft D in one direction—that in which it is moved by the spring D′—is limited by the contact of the perforated bracket E with the under side of the binder-arm-supporting tube B′, and movement of the rock-shaft in the opposite direction is positively imparted by the strain on the binding material as it is drawn from the source of supply by the pressure of the grain in the receptacle upon the binding material. That this movement of the rock-shaft may be given it with certainty to the desired extent (according to the amount of grain to be accumulated against the binding material to form a gavel) and the rock-shaft then be left free to assume its normal position as acted upon by its spring, the binding material is automatically clamped and released at the outer end of the rocking clasper by the actuations of a movable member of the clasper, which movable member is shown as formed by an endwise-sliding clamping-rod, F, guided in its movements relatively to the fixed main member C of the clasper by a perforated lug, *f*, on the main member and a guide-opening, *f′*, in the bracket C′. The outer end of the fixed member or lever C of the rocking clasper is forked or otherwise suitably recessed, and the upper end of the rod F is hooked or bent to form a lateral projection, f^2, entering the space between the forks of the clasper-lever. These forks are perforated above the bottom of the recess formed between them, and the cord or other binding material passes through these openings. The bent end of the movable or clamping section of the clasper crosses above the cord. A spring, G, secured at one end to the shank of the clamp and bearing at its opposite end against the guide-lug *f*, acts constantly with a tendency either to draw down the clamp so as to clasp the cord by its hook f^2, or to hold the clamp-hook down so as to press the cord against the bottom and sides of the recess between the forks of the clasper-lever and securely hold the cord, so that strain upon the cord sufficient to overcome the force of the spring D′ of the rock-shaft D will rock this lever at its outer end, at the point where it engages the cord, a distance determined by the amount of cord drawn out or supplied under tension to the binder-arm.

The clamp-rod F is bent or otherwise formed at its lower end, *g*, so as to present a sufficiently wide surface to insure the engagement therewith of an automatically-actuated tripper, which, as hereinafter will fully be explained, soon after the commencement of movement by the binder-arm, lifts the rod F against the action of its spring and frees the cord from the clamp of the rocking clasper, thus allowing the rock-shaft D to be oscillated by its spring, and also admitting of the passage of the binding material under tension to the binder-arm for encompassing and securing a gavel.

As binding mechanism suitably organized to be thrown into operation by tripping and clutch mechanism connected with and actuated by the rocking movements of the cord-clasping lever is shown and described in my before-mentioned application, description is herein given only of those features of suitable clutch mechanism and its controlling or tripping mechanism actuated by the cord-clasper, through or by way of the rock-shaft and its attachments, explanation of the construction and operation of which will be sufficient to show how the binding mechanism is thrown into and out of action so as to operate as fully explained in my aforesaid application.

As the grain, when packed into the binding-receptacle against the cord *a*, presses against

the cord with force sufficient to draw it through the binder-arm from the source of supply and positively rock the cord-clasper (by which the cord is now firmly held) and its shaft D, the tripping-arm or tappet D^2 will sooner or later (according to the amount of movement of the bracket E required to bring the pin *e* against the tappet) be set in motion and caused to swing with the rock-shaft.

When the desired amount of cord has been supplied, as pressed upon by the accumulating grain, to give the requisite amount of movement to the clasper-lever to rock the shaft D to a sufficient extent to cause the tappet to actuate the clutch-tripping mechanism to start the binding mechanism, the tappet strikes against an arm or heel projection, H′, of a tripping-lever, H, and vibrates this lever on a pivot, *h*, by which it is supported in the frame B^2. The outer bent or catch end, *h*′, of this lever is thus rocked against the pressure of a spring, h^2, away from a stud, *i*, at one end of a lever, I, pivoted at *i*′ on the inner face of an intermittingly-actuated gear-wheel, J. The opposite end of this lever I engages a stud which passes through a slot in the gear-wheel, and is fixed on a spring-actuated clutch-bolt or adjustable tooth, J′, mounted on the outer face of the gear-wheel, so that it may be slid endwise in radial guides thereon. When free to move by the release of the lever I, as above explained, this clutch-bolt is acted upon by its spring *j*, and is thus thrust forward to engage one of two spurs or teeth, *k k*, projecting from the outer face of a continuously-rotating driving-gear, K.

Sufficient motion is communicated to the normally stationary gear J by the engagement of its clutch-bolt with the gear K to bring the circumferential teeth of the two gears into contact, and thus at each action a complete revolution is imparted to the gear-wheel J.

When the gear-wheel J is at rest its toothless portion *k*′ is opposite the driving-gear K.

The above-described gears J K, the clutch mechanism thereof, and the tripping mechanism by which the gears are thrown into mesh by actuations of the clutch mechanism are all the same as or substantially correspond with features more clearly shown and fully described in my above-mentioned application, and, as shown and described in said application, a fixed cam on the frame B^2 serves to retract the clutch-bolt J′ by acting on its lever I, and leaves this bolt dogged by the catch of the tripping-lever H at the end of a revolution of the gear-wheel J.

The binder-arm is rocked and controlled by mechanism connected with and actuated by the gear-wheel J, as shown and described in my aforesaid application, and consisting in part of a sector-crank, K′, and pitman K″, Fig. 1, and this wheel serves also, as fully set forth in said application, to operate all other parts of the binding mechanism proper.

After the binder-arm starts, upon the throwing into action of the binding mechanism, the cord is released from the rocking clasper and left free to be supplied under tension in any desired quantity by the action of a rocking tripper, L, which, as in this instance shown, is actuated by a heel attachment of the binder-arm and formed by a curved arm pivoted at its inner end to a lug or bracket, M, on the frame-tube B′, by means of a socket, *l*, a thimble or bushing, *m*, fitted therein, and a headed bolt, *m*′, passing through said thimble and bracket M, and provided with a washer and nut. The tripper is curved and crosses the frame-tube B′, resting in its normal position upon this tube. The outer end or toe, *l*′, of the tripper, when not in action, rests beneath and clear of the lower end, *g*, of the sliding clamp of the cord-clasper. The tripper is provided with a laterally and downwardly projecting heel attachment or tappet-like arm, *n*, to be operated upon by the heel attachment of the rocking binder-arm, consisting of a segmental flange or curved guide, N, concentric with the axis of the binder-arm and on that side of its heel next the tripper. This guide N is formed with a lip, N′, at its lower end, or where it first begins to act upon the tappet *n*, as soon to be explained. This lip inclines outward or away from the axis of the binder-arm. An inclined ended rib or projection, *n*′, is also provided upon the binder-arm heel near the lip N′.

From the above description it will be understood that upon the commencement of the downward movement of the binder-arm the tappet *n* will be struck by the incline or lip N′ and directed inside the guide N, thus rocking the tripper upward at its nose to bear against the lower end of the clamp-rod F, and by positive pressure move this rod upward against the action of its spring to release the cord from the clamp formed by the upper end of the rod F and the forks of the clasper-lever C.

It should be noticed that the end *g* of the clamp-rod, when elevated by the tripper, is in line with the axis of the rock-shaft D, thus preventing cramping or interference with the oscillating movement of the rock-shaft by the action of its spring.

The cord is left unclamped by the rocking clasper-lever C until by the upward movement of the binder-arm the tappet of the tripper L is released by the guideway N N′. Should not the tripper fall by its own weight or yield to the pressure of the spring G of the clamp, it will be positively rocked downward into its normal position by the action of the incline *n*′ on the binder-arm heel, as will readily be understood.

The binding material *a* is supplied from a ball, O, (or, if preferred, from a spool, as usual,) located by preference in a box, O′, provided with a hinged door and suitable fastening device, and supported upon an arm, O^2, bolted to the tubular frame B′. The desired tension is exerted upon the cord as drawn from the

box by the action upon the cord of two rollers, P P, between which it is passed and compressed to exert friction upon it after being threaded through a guide slot or eye in a fixed cross-bar or bracket-arm, *p*, which prevents the cord from slipping along the rollers or off them at their ends. One of the rollers is mounted to rotate in fixed bearings, and the other is mounted in spring-actuated bearings, so that it may be held against the cord with sufficient force to bear it against the fixed roller with the pressure desired to produce that amount of frictional resistance to the passage of the cord between the rollers which will give the tension required. In Figs. 1, 2, and 5 the spring-actuated or yielding roller is shown as mounted in box-bearings *p' p'*, movable in suitable guideways toward or away from the fixedly-supported roller, and acted upon by the free ends of upright spring-arms *q q*, fixedly attached at their lower ends to the inside of the box O'. The spring-arms are connected at a suitable distance above their lower fixed ends by a cross-bar, Q, which is acted upon by a set-screw, Q', so that the spring-arms may be caused to yieldingly bear with the desired pressure upon the roller-boxes. The cord passes from the box through the slot *o'* to the rocking clasper and binder-arm, as before explained.

Figs. 7 and 8 show a modification of the tension apparatus, coiled springs S S being employed to act upon the adjustable roller instead of the plate springs or arms *q q*, before described. The set-screw and cross-bar serve to adjust the pressure upon the springs, and so regulate the grip upon the cord in a manner readily understood.

The above-described tension apparatus, when suitably adjusted to cause the desired bite upon the cord, will obviously produce a practically uniform tension upon the cord, regardless of the size or weight of the ball of cord or the amount of cord which may be wound upon the spool, when a spool is employed.

It will further be obvious that the convex rolling surfaces between which the cord passes will not cut or injuriously abrade the cord as angular or broad bearing-surfaces would, and that the rollers will readily accommodate inequalities in the cord.

It should be noticed that the strain exerted by the grain upon the binding material is positively imparted to the starting mechanism, as the binding material is firmly gripped by the clasper during the accumulation of the grain. I thus avoid irregular work or uncertainty of action, such as occasioned by the slip of the cord around the starting-pulleys heretofore employed.

I am further enabled by means of my improvements to cause the binding material to act upon the starting mechanism with any required force by making the clasper of the proper length to exert the leverage desired, and this without crowding or interference with other parts.

I do not broadly claim mechanism set in motion by the strain exerted upon the binding material by the accumulating grain and serving to start binding devices; nor do I broadly claim the combination of starting mechanism actuated by the strain produced upon the binding material and binding mechanism thrown into action by the starting mechanism and automatically thrown out of action after a bundle is bound; nor do I broadly claim such starting mechanism when adjustable to operate in such manner that the binding mechanism may be thrown into action by the accumulation against the binding material of a greater or less amount of grain, so that gavels of varying sizes may be bound; nor do I broadly claim such starting mechanism when adapted to release the binding material or allow it to be freely supplied after the binding mechanism is thrown into action; nor do I unqualifiedly claim a tension device consisting of the combination of a fixedly-supported roller and a movable spring-actuated roller, as all of said mechanisms and combinations, unless properly restricted, are older than my improvements hereinafter claimed. I do not, however, wish to be understood as confining my invention to mere details, either of construction of parts or arrangements of devices, as hereinbefore particularly described; nor as limiting my improvements in starting mechanism to use in connection with an organization of devices, such only as serving to actuate the particular binding mechanism described.

I claim as of my own invention—

1. A clasper clamping the binding material during the accumulation of the grain to form a gavel, and positively actuated by the pull of the binding material as it is strained by the pressure of the grain to throw binding mechanism into action with certainty when a sufficient quantity of grain has been accumulated to form the gavel, substantially as hereinbefore set forth.

2. The combination, substantially as hereinbefore set forth, of apparatus for supplying the binding material, a receptacle in which the grain is accumulated under pressure against the binding material, and a clasper gripping the binding material and positively actuated by the pull of the binding material as strained by the pressure of the accumulating grain to throw binding mechanism into action, and automatically actuated to release the binding material and leave it free to be supplied under tension to secure the bundle.

3. The combination, substantially as hereinbefore set forth, of a receptacle in which the grain is accumulated under pressure against the binding material, a binder-arm from which the binding material passes under tension to the receptacle, an oscillating clasper clamping the binding material before its passage to the receptacle by way of the binder-arm and actuated by the strain exerted upon it by the binding material to throw binding mechanism

into action upon the accumulation of a gavel, and tripping mechanism for releasing the binding material from the clasper after the starting of the binding mechanism, for the purpose described.

4. The combination, substantially as hereinbefore set forth, of a receptacle in which the grain is accumulated under pressure against the binding material, a binder-arm from which the binding material passes under tension to the receptacle, an oscillating clasper clamping the binding material before its passage to the receptacle by way of the binder-arm and actuated by the strain exerted upon it by the binding material to throw binding mechanism into action upon the accumulation of a gavel, and mechanism by which to vary the amount of movement which is required to be imparted to the clasper to start the binding mechanism, for the purpose described.

5. The combination, substantially as hereinbefore set forth, of a clasper clamping the binding material and rocked in one direction by the pull of the binding material as it is strained by the pressure of the grain, a rock-shaft with which the clasper is automatically rocked in the opposite direction when the binding material is released, a binder-arm, and tripping mechanism actuated upon the movement of the binder-arm to release the binding material from the clamp of the clasper, for the purpose described.

6. The combination of the clasper, the rock-shaft to which it is secured, the spring acting upon the rock-shaft, the tripper acting on the clasper-clamp, and the binder-arm acting by its heel attachment upon the tripper, substantially as and for the purpose hereinbefore set forth.

7. The combination of the binder-arm, its heel attachment provided with the guideway, the tripper provided with the tappet actuated by said guideway, the clasper, and the spring-actuated clamp of the clasper acted upon by the tripper, substantially as and for the purpose hereinbefore set forth.

8. The combination of the rocking binder-arm, its heel attachment provided with the guideway, the tripper, its tappet acted upon by said guideway, the clasper, its spring-actuated clamp acted upon by the tripper-nose, the rock-shaft to which the clasper is secured, the spring acting on the rock-shaft, and the trip-arm or tappet on the rock-shaft acting upon tripping mechanism to throw the binding mechanism into action.

9. The binder-arm having the heel attachment provided with the curved guideway having the inclined end or lip N′, substantially as and for the purpose described.

10. The combination of the tripper and the binder-arm having the guideway and the inclined rib or projection n', substantially as and for the purpose hereinbefore set forth.

11. The combination, substantially as hereinbefore set forth, of the rocking clasper clamping the binding material and actuated by the strain on the binding material to rock it positively in one direction, the rock-shaft upon which the clasper is mounted, the spring acting on the rock-shaft to rock it in the direction opposite to that in which it is rocked by the movement imparted to it by the clasper, the trip-arm or tappet-rod on the rock-shaft acting upon tripping mechanism by which clutch mechanism for throwing binding mechanism into action is operated, and means by which to vary the amount of movement required to be imparted to the clasper to cause the tappet-rod to actuate the tripping mechanism, for the purpose described.

12. The combination of the rocking clasper clamping the binding material, its rock-shaft, the perforated bracket on the rock-shaft, the trip-arm or tappet-rod loosely mounted on the rock-shaft, and the adjustable stud of the bracket for acting on the tappet-rod, substantially as and for the purpose hereinbefore set forth.

13. The combination of the cord-holding box, the rollers between which the cord passes, the springs acting upon one of said rollers, the bracket-arm or guide-bar through an eye in which the cord is threaded before being passed between the rollers, and the binder-arm, substantially as and for the purpose hereinbefore set forth.

14. The combination of the roller mounted to rotate in fixed bearings, the roller mounted to rotate in sliding bearings, the springs acting on said sliding bearings, the cross-bar connecting the springs, the set-screw acting on said cross-bar, and the cord-guide beneath the rollers, as and for the purpose set forth.

In testimony whereof I have hereunto subscribed my name.

JOHN S. DAVIS.

Witnesses:
GEORGE W. HUMPHREY,
MAGGIE E. HUMPHREY.