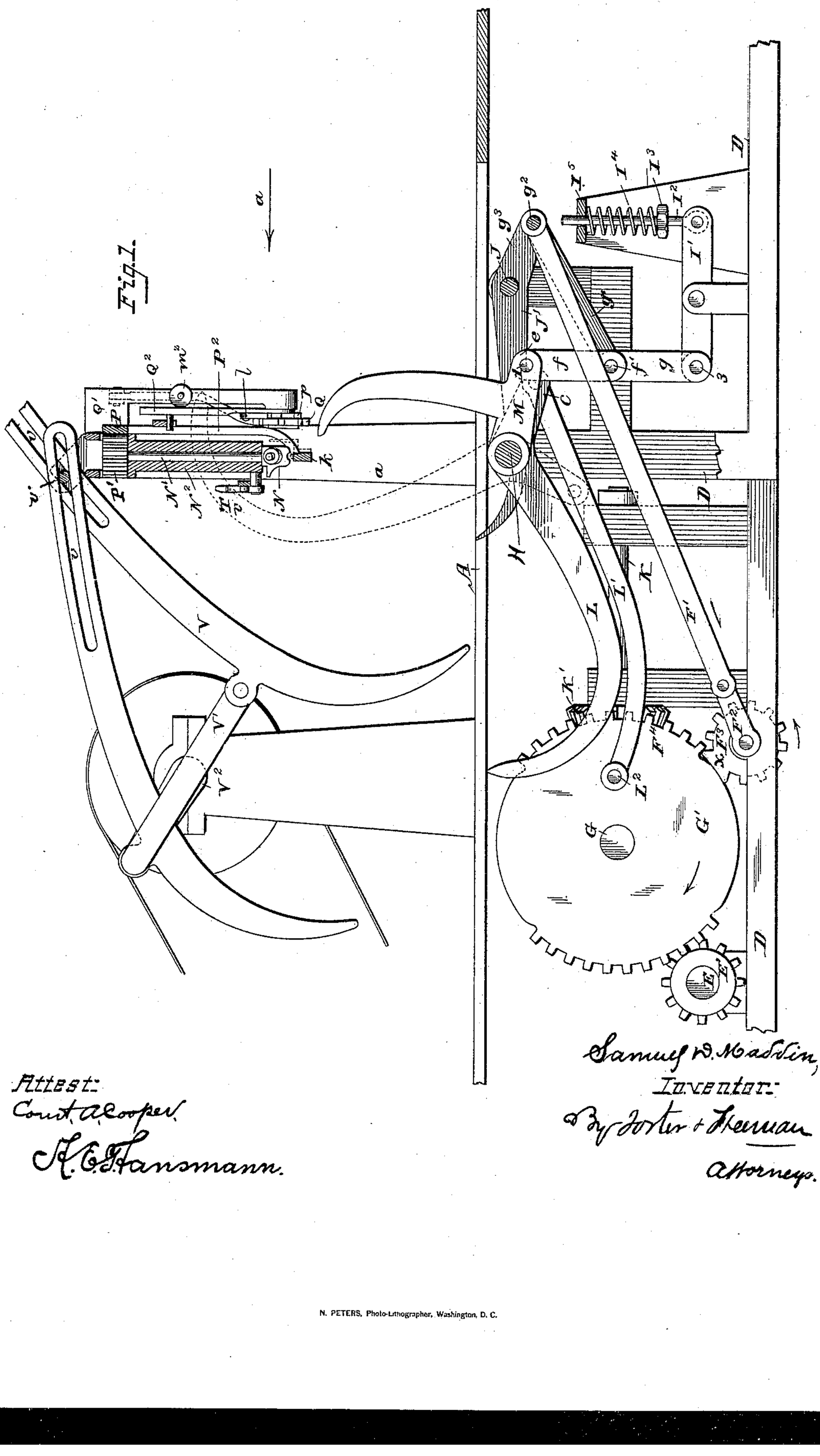
(No Model.) 7 Sheets—Sheet 1.

S. D. MADDIN.

GRAIN BINDER.

No. 409,795. Patented Aug. 27, 1889.

Fig. 1.



Witnesses:
Court. A. Cooper.
H. C. G. Fansmann.

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By Porter & Freeman
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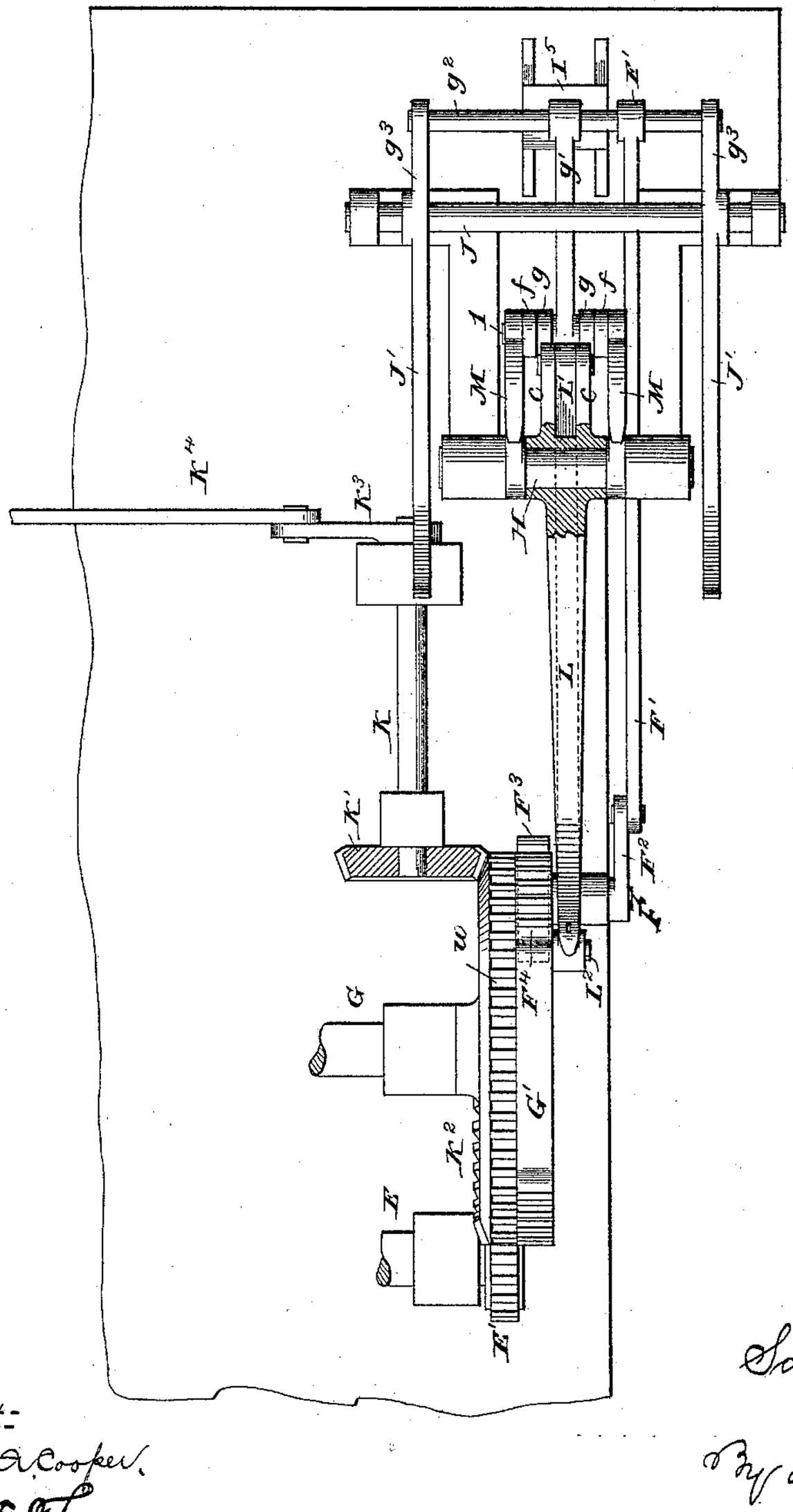
(No Model.) 7 Sheets—Sheet 2.

S. D. MADDIN.

GRAIN BINDER.

No. 409,795. Patented Aug. 27, 1889.

Fig. 2.



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S. D. MADDIN.

GRAIN BINDER.

No. 409,795. Patented Aug. 27, 1889.

Fig. 3.

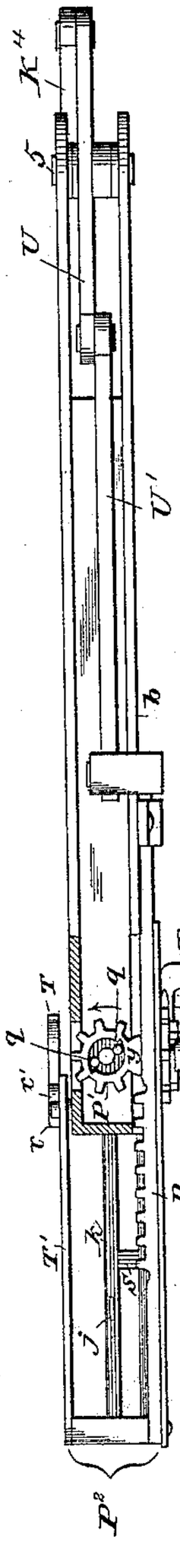
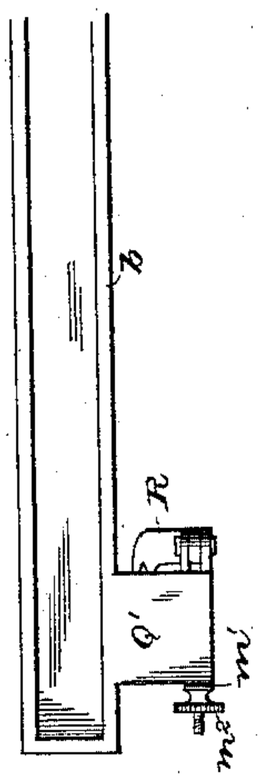


Fig. 4.



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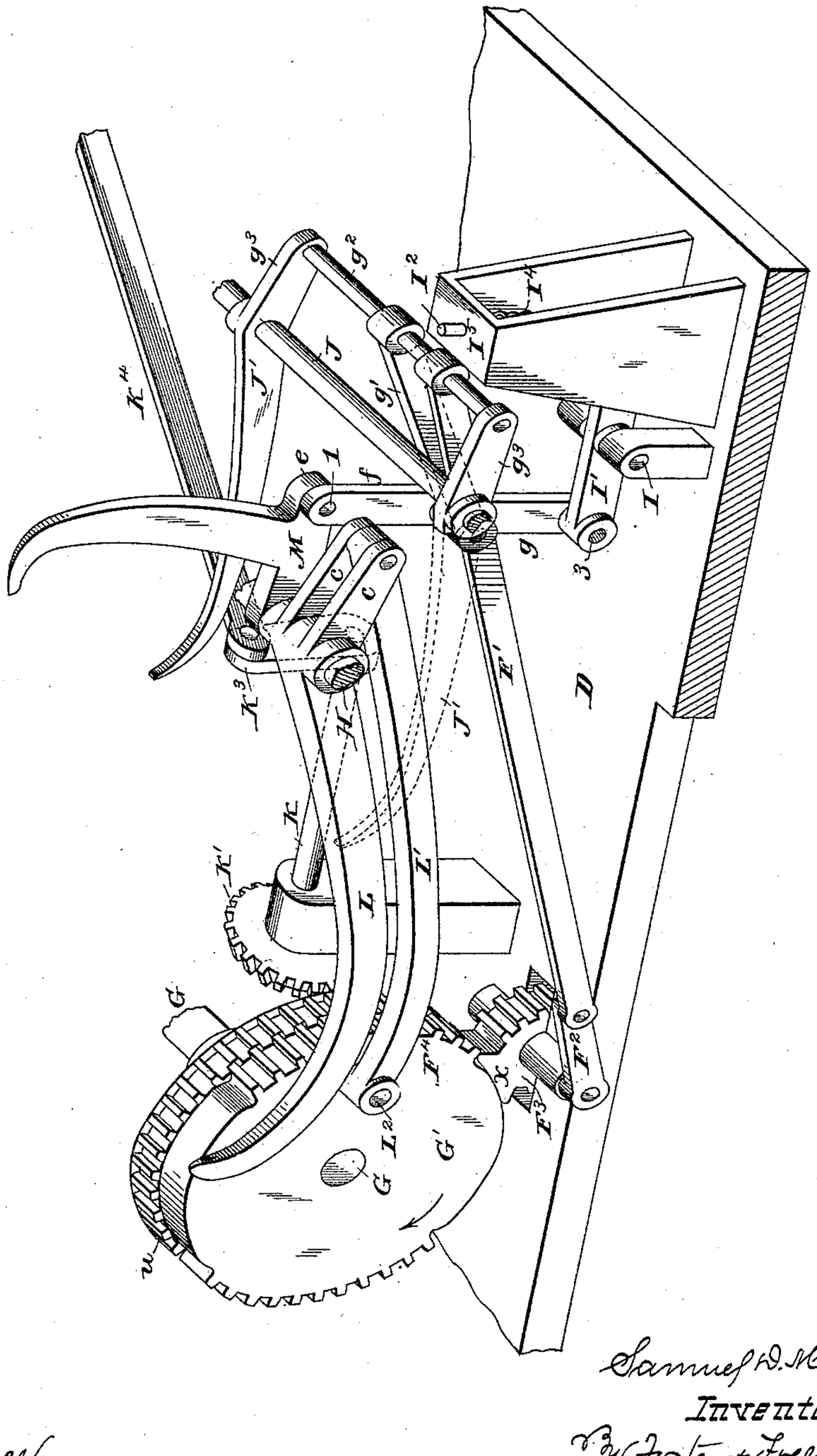
(No Model.) 7 Sheets—Sheet 4.

S. D. MADDIN.

GRAIN BINDER.

No. 409,795. Patented Aug. 27, 1889.

Fig. 5.



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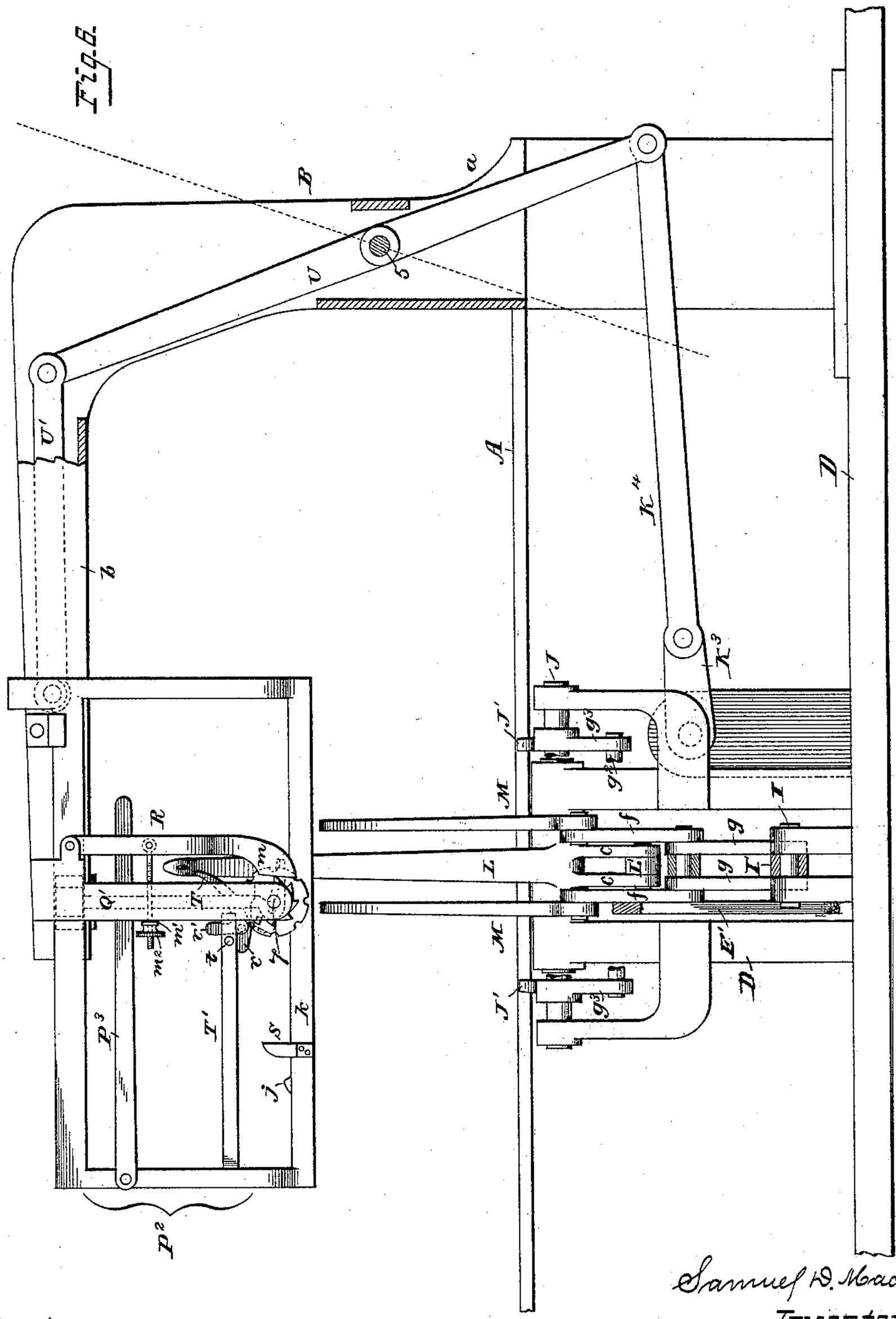

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S. D. MADDIN.

GRAIN BINDER.

No. 409,795. Patented Aug. 27, 1889.

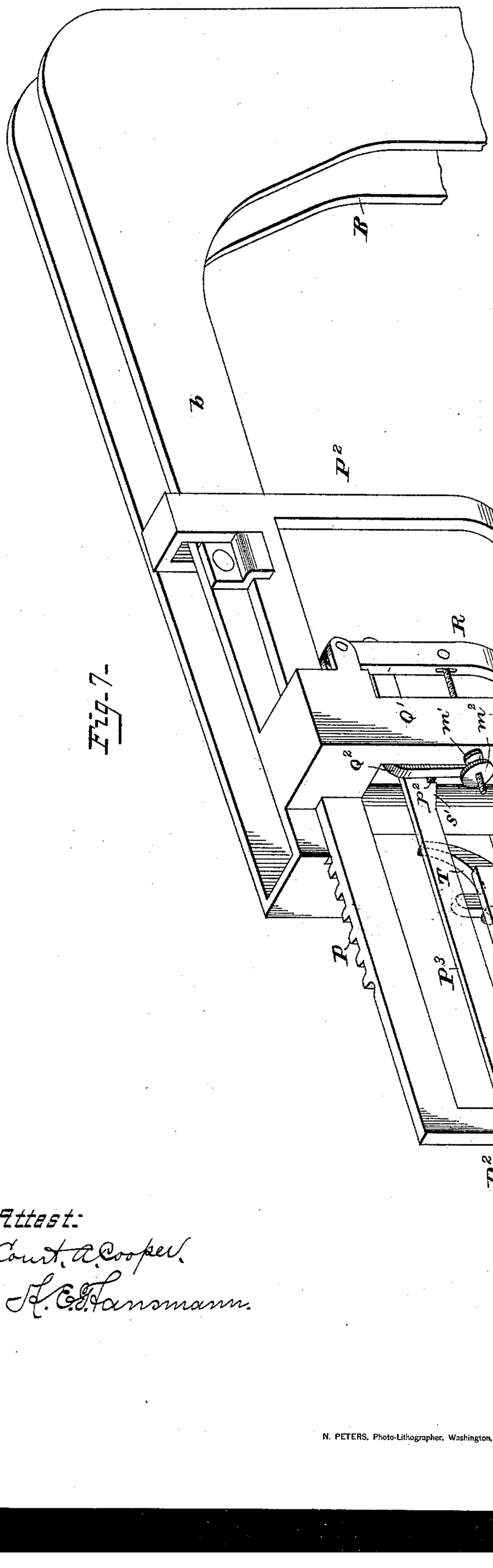

Fig. 7.

Fig. 8.

Fig. 9.

Fig. 10.

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S. D. MADDIN.

GRAIN BINDER.

No. 409,795. Patented Aug. 27, 1889.

Fig. 13.

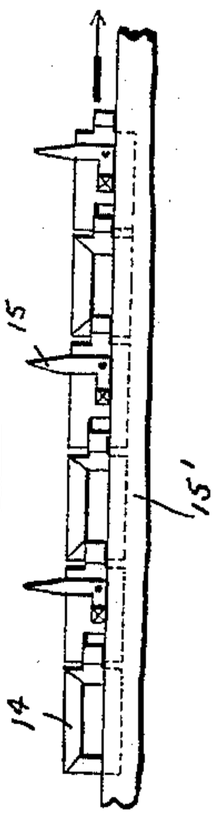
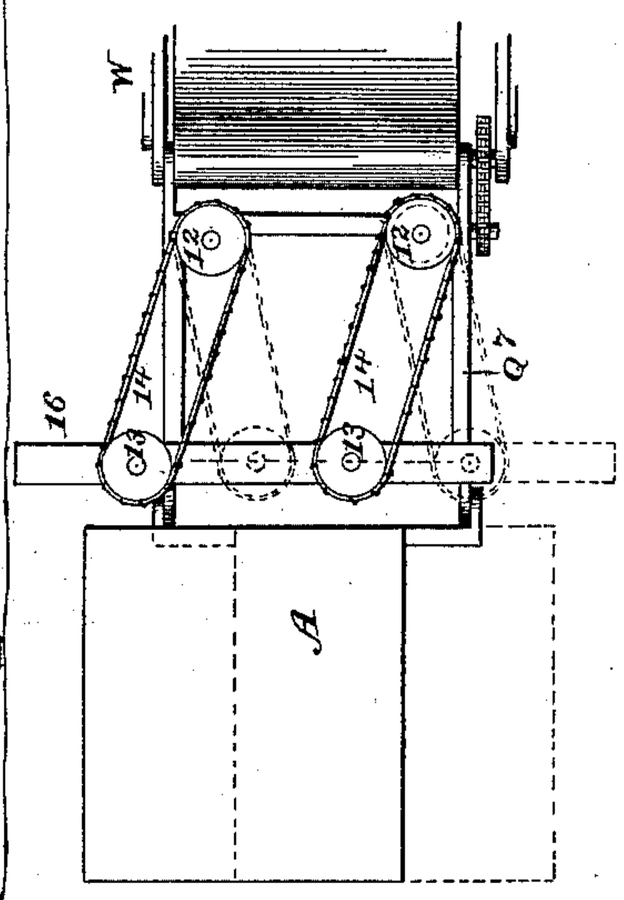


Fig. 11.

Fig. 12.



Witnesses:
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By Foster & Freeman
Attorneys.

UNITED STATES PATENT OFFICE.

SAMUEL D. MADDIN, OF MIAMISBURG, OHIO, ASSIGNOR TO MARY MADDIN AND AMADEE TETRAULT, OF SAME PLACE.

GRAIN-BINDER.

SPECIFICATION forming part of Letters Patent No. 409,795, dated August 27, 1889.

Application filed November 11, 1884. Serial No. 147,652. (No model.) Patented in Canada February 25, 1885, No. 21,150.

To all whom it may concern:

Be it known that I, SAMUEL D. MADDIN, a citizen of the United States, and a resident of Miamisburg, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Grain-Binders, (which invention has been patented in Canada by Patent No. 21,150, dated February 25, 1885,) of which the following is a specification.

My invention relates to improvements in apparatus for binding grain, and has for its objects to simplify the construction and operation of such apparatus, to reduce the weight and number of parts and the friction, and to properly direct the grain to and discharge the bundle from the packing mechanism; and these objects I effect by means of the appliances and the arrangement thereof, hereinafter fully set forth, and illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation, in part section, of my improved binder. Fig. 2 is a part sectional plan of Fig. 1, the platform and parts above it being removed. Fig. 3 is a part sectional plan of the overhanging arm and parts carried thereby. Fig. 4 is a plan of the end of the overhanging arm. Fig. 5 is a perspective view showing the parts of the apparatus below the platform. Fig. 6 is an elevation in part section, looking in the direction of the arrow *a*, Fig. 1. Fig. 7 is a perspective view of the upper part of the overhanging arm and parts carried thereby. Fig. 8 is a detached view of the knotter and device for throwing off the loop; Fig. 9, a detached view of the pawl-lever and operating-bar. Fig. 10 is a detached view of the cord-controller lever and operating-bar. Fig. 11 is a front view showing a harvester with my improved binder and the grain elevator and conveyer. Fig. 12 is a plan of part of Fig. 11. Fig. 13 is a detail view illustrating one of the horizontal straw-conveyers.

The platform A is overhung by an arm B, the vertical portion *a* of which is at the side of the platform and the horizontal portion *b* of which carries the knotting mechanism—that is, all the appliances for directing the cord carried by the needle for forming it into a knot and for severing the cord. Below the platform is a frame D, suitably constructed to afford bearings for shafts or studs E F G H K J, the shafts E, F, and G being parallel to the overhanging arm B, the shaft K rotating at right angles to the shaft G, and the shafts H and J, which are parallel to the shaft G, being rock shafts or bearings for levers and arms, as hereinafter set forth. The shaft H carries the needle-arm L, and the platform A, above the latter, is slotted to permit the arm to rise and fall above and below the platform, and a connecting-rod L′ extends from a crank-pin L^2 upon a disk G′, secured to the shaft G, to short arms *c c*, projecting from the hub of the needle-arm, so that the rotation of the disk G′ is made the means of vibrating the needle-arm between the limits indicated in full and dotted lines, Fig. 1.

To the shaft H are hung two arms M M, constituting the compressor, and to ears *e*, at the outer ends of said arms, are jointed the upper links *f f* of toggle-levers, the lower links *g* of which are jointed to a horizontal lever I′, hung to a stud I and connected at the outer end to a bar 12, carrying a nut 13, between which and a stationary bearing 15 of the main frame intervenes a coiled spring 14.

In combination with the toggle-support for the compressors, I employ a trip operated positively and independently of the needle from the intermittently-moved disk G′, said trip being adapted to move said support and thereby permit the compressors to recede below the binder-platform, and such a tripping mechanism I will now describe. A link *g′* is hung to a pin *f′*, connecting the links *f* and *g*, and is connected at the outer end to a bar g^2, extending between two arms g^3 g^3 upon the shaft J, which carries the discharge-arms J′, the latter extending back beyond the shaft H, as shown in Figs. 1 and 2. To the bar g^2 is connected a rod F′, which is attached at the inner end to the pin of a crank F^2, upon the end of the shaft F, and a pinion F^3 upon the latter gears with a toothed segment F^4 of the disk G′. As the pinion F^3 revolves in the direction of its arrow, Fig. 1, the rod F′ will be drawn back in the direction of its arrow and the shaft J will be rocked so as to throw the discharge-arms J′ above the plat-

form, (passing through suitable slots therein,) and at the same time the link g' will be thrust back, so as to bring the toggle-links f g at an angle to each other, thereby swinging the compressor-arms M upon the shaft H and carrying the compressor below the platform as the discharge-arms rise through and above it. The toggle-joint arrangement above described serves to lock the compressor-arms in place, so as to resist the thrust or pressure of the gavel upon them, the centers 1 f' 3 being in line, Fig. 1, when the arms are elevated and holding the same immovably in position, except so far as a slight play is permitted by the yielding of the spring 14, which is compressed by the nut 13 to such an extent as to permit the arms to yield only when a destructive pressure is brought against them. When the bundle is to be discharged, the backward draft of the connecting-rod F' causes the center f' to be carried to one side, when the arms will be unlocked and will swing downward to the position shown in Fig. 5 and the discharge-arms will be elevated, as shown in said figure, throwing the bundle off from the platform.

As the compressor-arms are held stationary during the time that the needle-arm is rising and the bundle is being tied and packed, the pinion F^3 should occupy a stationary position at such time. I therefore construct it, as shown, with a delay-shoe x, which remains opposite the corresponding flat delay-surface of the disk G' until the latter has turned to bring the rack F^4 into gear with the teeth of the pinion, when the latter will be revolved one revolution and then be again locked in its previous position, this movement being sufficient to carry the toggle-levers out of line, depress the compressor-arms and elevate the discharge-arms, then lower the latter, and again carry the compressor-arms to an elevated position and lock them in place.

The knotting device N may be of any suitable construction. As shown, it is a hook having a stationary and a movable jaw, as is common in devices of this class, and is carried at the lower end of a vertical shaft N', which turns in a vertical stud N^2, pendent from the under side of the portion b of the overhanging arm B. The knotter normally occupies the position shown in Fig. 7, and is revolved in the direction shown by the arrow, Fig. 3, and is locked in position after each revolution by means of a reciprocating rack P and pinion P', the rack in the present instance constituting part of a frame P^2, which slides in bearings in guides upon the overhanging arm, and the pinion P', having a flat face y, which when opposite the flat portions of the rack-bar prevents the revolution of the pinion, thereby locking the knotter in its position while the motion of the frame continues. The pinion P' is loose on the shaft N', and has two recesses with inclined faces, and two loose rolls q q, constituting a clutch, which permits the pinion to revolve in one direction without turning the shaft. Any other suitable device may be used for this purpose.

Instead of dragging the knot off the end of the knotter, as heretofore, by the weight of the bundle or by the action of the discharge-arm, I carry the loop positively over that portion of the cord clamped between the jaws, by means of a projection j upon a reciprocating bar—as, for instance, on the lower longitudinal bar k of the frame P^2, and I provide the lower jaw of the knotter with a longitudinal groove i, into which the projection j passes, so as to strike the loop of cord and carry it off of the jaws as the frame P^2 moves in the direction of its arrow, Fig. 7.

The cord-holding disk Q is supported at the side of and a short distance from the knotter by an arm Q', pendent from the overhanging arm and carrying a stud 7, upon which the disk turns, the said disk being provided with notches, as usual, and its edge passing between clamp-plates m m, (best shown in dotted lines, Fig. 7,) carried by a bar R, hung to the side of the arm Q', and provided with a screw-rod which passes through the arm Q', and carries a rubber disk or spring m' and a nut m^2, so that the clamp-plates may be drawn toward the cord-holding disk with any desired degree of tension. At the side of the disk is a ratchet-wheel p, and upon the stud l swings a lever Q^2, provided with a pawl p', which engages with the teeth of the ratchet-wheel, and a bar P^3 is hung to the frame P^2 and bears upon a stud p^2, projecting from the side of the lever Q^2. (See Fig. 9.)

At the under side of the bar P^3 are two projections s s', with an intermediate notch w, one side of the projection s' being inclined, as shown, and all being so arranged that when the frame P^2 is at the limit of its movement in the direction of its arrow, Fig. 7, the stud p^2 will occupy a position in the notch w. When the frame P^2 moves in the direction of its arrow, Fig. 7, the contact of the side of the projection s' with the stud p^2 will carry the lever Q^2 forward until the disk Q is turned the distance of one tooth or notch, so as to catch the cord laid in it by the needle and jam the same between the plates m, when the projection s' will pass over the stud p^2, and the movement of the frame P^2 will be continued until the revolution of the knotter is completed, and until a knife S, carried by the frame, cuts the cord, and until the projection j carries the loop of cord off of the end of the knotter. When the frame P^2 is carried in the direction of the arrow 2, Fig. 9, the bar P^3 will slide over the stud p^2 until the projection s' is carried over the stud and the latter is again brought into the notch w, when the projection s, striking the stud, will cause the lever Q^2 to be carried to its first position.

In order to insure the folding of the cord downward over the side of the knotter, so as

to be caught and properly form the loop when the knotter revolves, I use a vibrating lever T, having two arms r r' at right angles to each other and pivoted to an arm of the stud N^2, so that it may be brought to either of the positions shown in full and dotted lines in Fig. 10, and so that when it swings downward, after the needle has been brought to the position shown in Fig. 6, its long arm will cross the cord beneath the needle, and will carry the same down against and below the knotter-jaws. The movements of the lever T are imparted by the contact of a stud t with the arms r r', the said stud being carried by a bar T', secured to the frame P^2, the stud upon the first movement of the frame P^2 striking the arm r' and causing the lever T to swing rapidly to its lowest position before the rack P engages with the pinion P'. The lever T is carried back to its first position by the contact of the stud t with the arm r.

The frame P^2 is caused to slide back and forth by the vibration of a lever U, pivoted to a stud 5 upon the standard a, the lever being connected to the sliding frame by a connecting-rod U' and the parts all being arranged as shown, so that the operating movements of the knotter devices—that is, the knotter-jaws, cord-clamp, cord-controller or lever T, knife, and discharge-stud—are all effected as the frame P^2 is drawn in the direction of its arrow, Fig. 7. I thus avoid the lost motion and uncertain actions that would tend to result if the movements were effected by the thrusting action upon the connecting-rod, which, under such circumstances, would tend to buckle or bend.

By driving all the knotter devices from a reciprocating frame carried by the overhanging arm I avoid the necessity of shafts or gears between the knotter devices and the driving-shaft below the platform, so that the movements are not only less complex, but there is less lost motion and strain.

The vibration of the lever U is effected from the disk G' through the medium of the shaft K, pinion K', segmental rack K^2 upon the wheel G', crank K^3 on the end of the shaft K, and connecting-rod K^4, the rack K^2 being so arranged upon the disk that the shaft K will be turned and the lever U swung to draw back the frame P^2 after the needle L has attained its upward and forward position.

By the use of a lever vibrated by means of mechanism below the platform and of a frame carried by said lever above the platform and constructed to operate the various devices carried by the overhanging arm I am enabled to dispense with the customary series of gears and shafts between the parts above and below the platform, and thereby greatly reduce the weight of the machine and the friction and noise in operating the parts and render it much more simple and less liable to get out of order.

The disk G' is driven from a pinion E' upon the driving-shaft E, which pinion meshes with teeth u upon the periphery of the disk, the motion of which is of course arrested at proper intervals by means of the ordinary stop device used in this class of machines, and not necessary to be here described.

It will be seen that by the construction described I am enabled to impart all the movements required to the devices, both below and above the platform, from a single operating-disk G', thereby avoiding a multiplicity of shafts and connections and correspondingly reducing the friction and weight.

In connection with the machine constructed as set forth I employ packer-arms V, which are arranged above the platform A and are connected, as usual, to the cranks V' of a double-cranked packer-shaft V^2, each of the arms having a slot v, to receive a guide-bar v', supported by the overhanging arm of the machine.

While the shaft V^2 may be driven through the medium of a suitable chain or gears from the shaft G, I prefer to drive the shaft V^2 from one of the shafts of the harvester to which the binder is applied, thereby taking the weight and strain off of the binder, and avoiding the necessity of operating any part of the binder devices except during the operation of knotting the cord and throwing off the bundle.

The machine described may be arranged upon the harvester in an inclined position, as usual; but I prefer to arrange it horizontally between the elevator and the outer wheel of the harvester, in which case the elevator will carry the grain to the platform, the packers will carry it over the platform against a compressor-arm, and the discharge-arms will throw the bundle from the platform over the wheel. An effective arrangement of this character is illustrated in Fig. 11, which represents a harvester provided with two driving-wheels 71 and 8, an axle 10, supporting an intermediate platform 9, and standards 11, upon which the binder is supported. An elevator W carries the grain from the cutter-frame G^5 to a horizontal carrier L^5, arranged between the upper end of the elevator W and the inner edge of the binder-platform A. The elevator W is constructed substantially as set forth in my application, Serial No. 134,776, filed June 13, 1884; but the intermediate carrying device, instead of consisting of sprocket-chains turning upon vertically-arranged pulleys, consists of horizontal pulleys 12 13, carrying chains 14, provided with the usual jointed feeding-teeth 15, (see Fig. 13,) the pulleys 12 being driven through the medium of suitable gear from the shaft of one of the upper elevator-rollers, and these shafts being carried by a frame Q^7, hinged at its inner end near to the edge of the platform A and at its outer end to the frame of the elevator W.

While I do not wish to be limited to any particular style of conveyer having jointed feeding-teeth for use in connection with the horizontally-arranged pulleys just described,

that form shown in Fig. 13 operates satisfactorily. In said figure each alternate link of the chain 14 is shown as being centrally open to engage with the sprockets on the pulleys, while the remaining links have pivoted thereto the feeding-teeth 15, each of which is provided with a laterally-projecting arm adapted to ride upon the rail 15′, and be thereby held in an upright position to engage with the advancing grain. It will of course be understood that the portion of the chain which travels against the moving stream of grain has not arranged adjacent thereto a rail 15′, so that the teeth are free to fold or lie down.

It is common in this class of machines to bring the butts of the grain against deflecting-plates set at an angle for the purpose of moving the grain to one side or the other, which purpose is thereby but very inefficiently accomplished. I carry the grain between the elevator and the binding-platform at any desired angle by making the pulleys 13 adjustable by securing them to a bar 16, capable of longitudinal adjustment, whereby the carrying-chains may be set at any desired angle, as shown in dotted lines, Fig. 11, the grain being thus positively conducted in its desired course. This is an important feature of my invention, as it, in addition to other advantages, avoids the necessity of shifting the position of the binder to properly receive the grain.

In order to permit the cutter-frame to be set at any desired height and to float over the ground without interfering with the operations of the elevator and conductor, I hinge the lower portion of the frame of the elevator W to the adjustable cutter-bar frame, or to any of its connections, and the upper portion, as before described, to the frame Q^7. In such case the vertical movements of the cutter-bar frame will simply alter the angle of the elevator and conductor frames to each other without interfering in any degree with their joint operation in conveying the grain from the cutter-frame to the platform, and without interfering with the lifting of the cutter-bar frame to a vertical position to permit the machine to be carried through narrow passage-ways.

By arranging the binder in a horizontal position above the supporting-wheels I am enabled to set it in line with the elevator and can conduct the grain in a continuous, nearly straight course without throwing it in front or to the rear of the wheels, as has been necessary heretofore in many cases.

By placing the binder between two drive-wheels the weight gives traction, there is less side draft, and the width of the machine is reduced, as the reduction of side draft allows the horses to be placed nearer the side of the machine.

I have in this application shown some features also shown and claimed in my application, Serial No. 171,222, and I do not therefore here make any claim to these features.

I claim—

1. In a grain-binder having the knotting mechanism supported from a standard overhanging the platform and the needle pivoted below the platform, a pivoted lever extending above and below the platform, and reciprocating connecting-rods jointed at their ends to the said lever and connected, respectively, with the knotting mechanism above the platform and the driving mechanism below the platform, substantially as described.

2. The combination of the knotting mechanism of a grain-binder supported above the platform by an overhanging arm, a pivoted operating-lever extending above and below the platform, an intermediate sliding frame and connecting-rods jointed at their ends to the lever and connected, respectively, with the sliding frame and with the driving mechanism, substantially as described.

3. In a grain-binder, the combination, with the needle, the compressor, and the discharge-arm, all hung below the platform, and the knotting devices above the platform, of a rotating disk G′, arranged below the platform, and which drives all of said devices, a wheel K′, mounted in a plane at substantially right angles to the disk and driven directly thereby and arranged between the latter and the knotting mechanism, and connections between the wheel K′ and the knotting devices, substantially as described.

4. In a grain-binder, the combination of the knotting devices above the platform, the needle, the compressor, and the discharge-arm, all mounted below the platform and supported upon parallel shafts, a disk G′ in a plane at right angles thereto, the wheel K′, a reciprocating rod operating in a plane parallel with the shafts driven by the wheel K′, and reciprocating connections between the rod and the knotting devices, substantially as described.

5. In a grain-binding harvester, the combination, with a binder-platform, the needle, the compressor, the discharge-arm, and the knotting devices, the latter being above the platform, of a main revolving disk G′, mounted below the platform to drive the needle, the compressor, and the discharge-arm, a wheel K′, a rod driven thereby below the platform, a pivoted lever extending above and below the platform, and a second rod connecting the lever with the knotting mechanism, substantially as described.

6. The combination of the rotating knotter-hook, the cord-clamping disk, the cord-controlling lever T, supported adjacent to the hook, and a reciprocating frame and connections, whereby the moving of the frame in one direction is caused to operate the said parts to form the knot, substantially as described.

7. The combination of the needle, a compressor pivoted upon the needle-shaft, a toggle-brace which supports the compressor, and a trip for the toggle independent of the needle for vibrating one of the toggles of the

brace to permit the descent of the compressor, substantially as set forth.

8. The combination, with an intermittently-moved disk and the needle driven therefrom, of the pivoted compressor, the supporting toggle-links pivoted to the compressor and to a support carried by the frame of the machine, and a trip connected with the toggle-links and arranged to move them to break the support for the compressor, the trip being positively operated, independently of the needle, by a link connected with the said intermittently-moved disk, substantially as described.

9. The combination, with an intermittently-moved disk, of the pivoted compressor, the supporting toggle-links pivoted to the compressor and to a support on the frame of the machine, the discharge-arm positively operated from the said disk, a trip connected to the toggle-links and to the discharge-arm, and a link connecting the discharge-arm with the disk, whereby the toggle-links are moved to permit the withdrawal of the compressor upon the advancement of the discharge-arm, substantially as described.

10. The combination of the compressor-arms hung directly to a shaft or pivot below the platform, the toggle-links connected to the said arms and to a support carried by the frame of the machine, and a reciprocating rod pivoted to the central joint of the said toggles, whereby it operates them both to support the compressor-arms and to let them fall, substantially as described.

11. The combination of the pivoted compressor-arm, the toggle-links, the trip for the toggle-links, the lever I′, and a spring-bearing for the said lever, substantially as described.

12. The combination of the compressor-arm, the toggle-links, the trip for the toggle-links, the lever I′, the bar I^2, and the spring and nut, substantially as described.

13. The combination of the compressor and discharge arms, the toggle-links, the support therefor carried by the frame of the machine, the connecting-rod g', and the operating-crank and connecting-rod F′, substantially as described.

14. The combination, with the binder-platform, the knotting devices, a needle, the discharge-arms, and the compressor, of a rotating disk G,′ connected to drive the needle, and having the spur-gear segment F^4 and the bevel-gear segment K^2, the shaft F, driven by the gear-segment F^4 and connected to drive the discharge-arms, the shaft K, arranged at an angle to the shaft F and provided with a crank, a rod driven by the crank, and a pivoted lever connected with the knotting devices driven by the link, substantially as described.

15. The combination of the binder-frame, the drive-wheels of equal size supporting the said frame and both connected to drive the operating mechanism, a cutting apparatus and grain-platform on one side of the binder-frame, an elevator delivering the grain from the grain-platform over the inner one of said wheels, a binder-platform supported by the binder-frame between and extending over the wheels on the stubble side of the machine, and a binder supported by the frame between the wheels and provided with ejector-arms arranged to discharge the bound bundles from the platform over the last said wheel, substantially as described.

16. The combination of the binder driving-wheels of substantially equal size, both connected to drive the operating mechanism, an elevator delivering the cut grain over the inner one of said wheels, the binding-table arranged above and projecting over the wheel on the stubble side of the machine, a frame supported by and between the wheels below the binding-table and supporting the shafts and their connections of the grain-binder, and an arm projecting above the platform and the cord knotting and cutting devices supported by said arm, substantially as described.

17. The combination, with the elevator and binder, of the horizontally-arranged pulleys and the chains provided with jointed feeding-teeth passing around the pulleys, and a bar, adjustable, supporting the pulleys next to the binder, substantially as set forth.

18. The combination, in a harvester, of a binder supported between two wheels, a vertically-adjustable cutter-frame outside the wheels, an elevator-frame jointed at the lower end to the adjustable cutter-frame, and a frame carrying a grain-conveyer jointed at the outer end to the upper portion of the elevator-frame and at the inner end adjacent to the platform of the binder, substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

SAMUEL D. MADDIN.

Witnesses:

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H. A. HALL.