(No Model.) 5 Sheets—Sheet 1.

H. TUTTLE.

GRAIN BINDER.

No. 547,699. Patented Oct. 8, 1895.

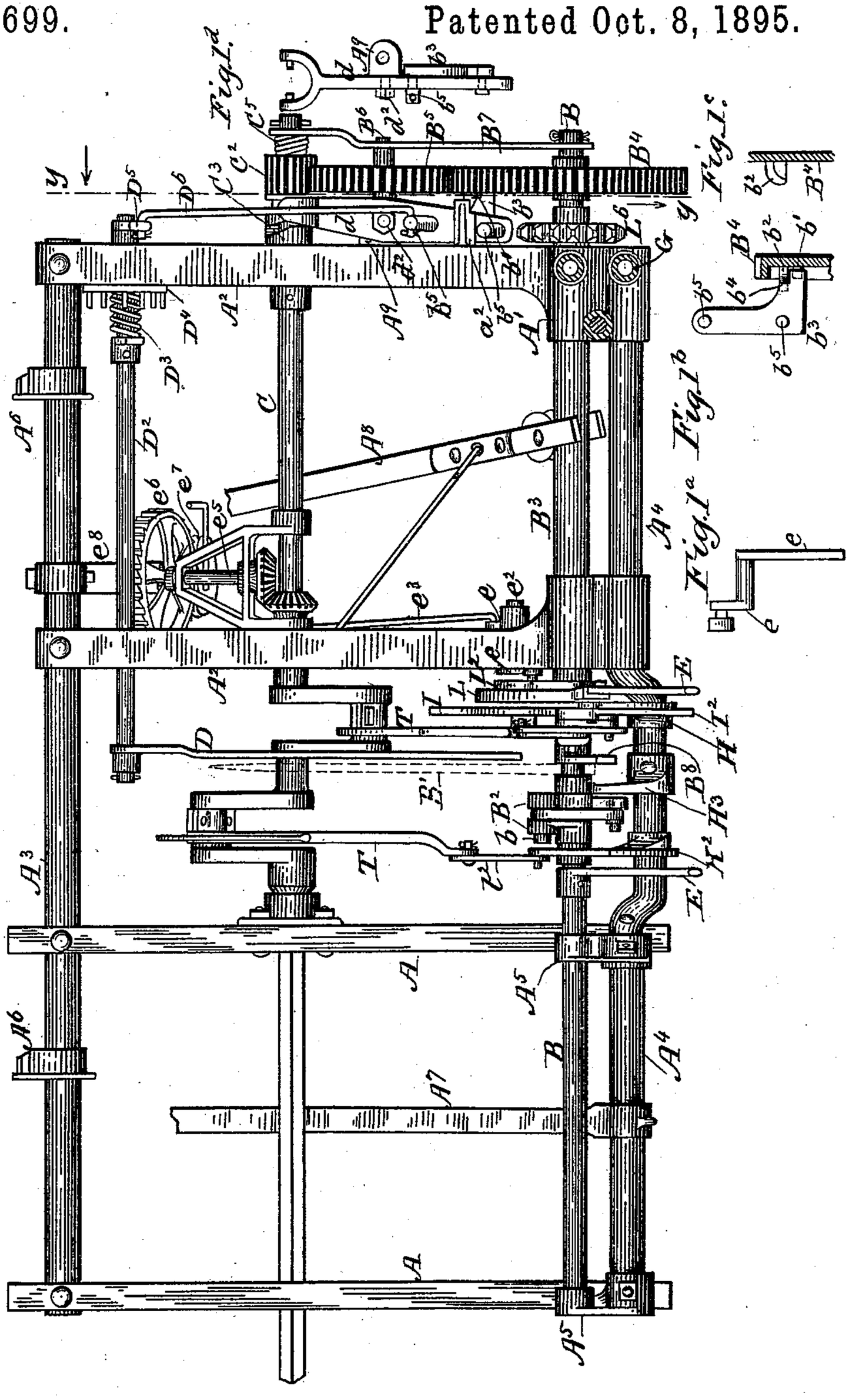

Fig. 1.

Fig. 1a.

Fig. 1b.

Fig. 1c.

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(No Model.)

5 Sheets—Sheet 2.

H. TUTTLE.

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Fig. 3.

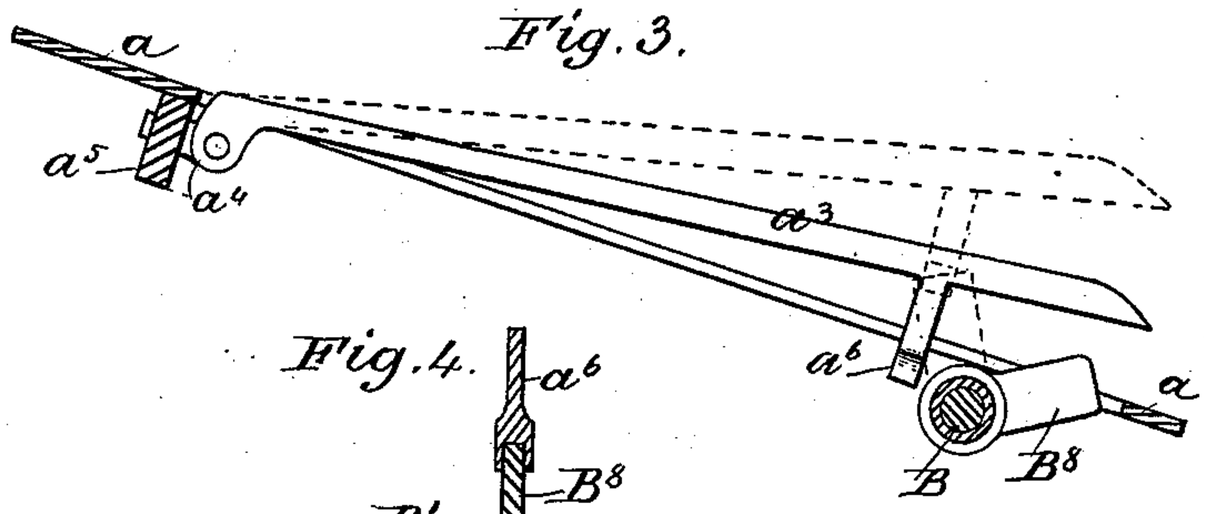


Fig. 4.

Fig. 2.

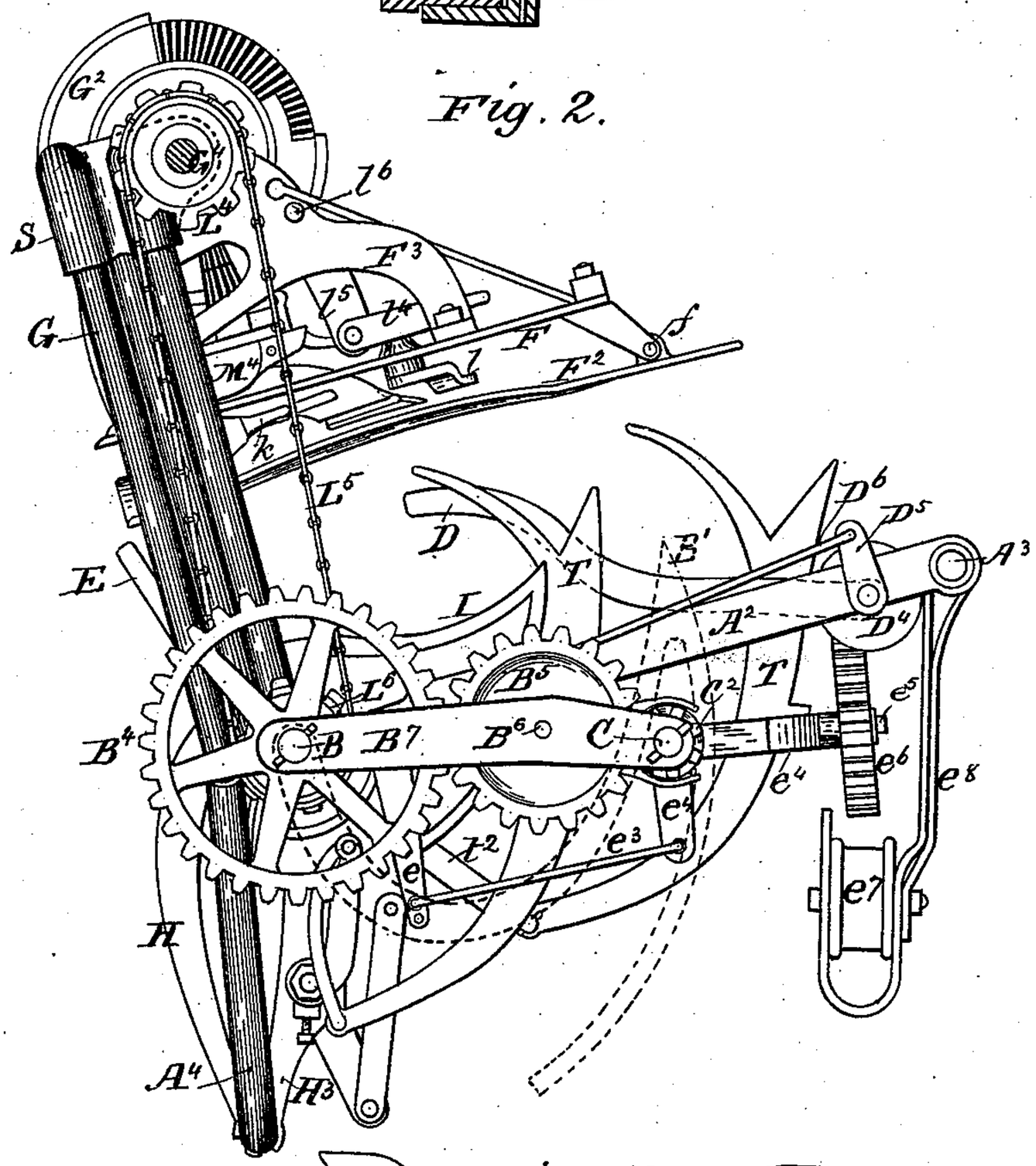
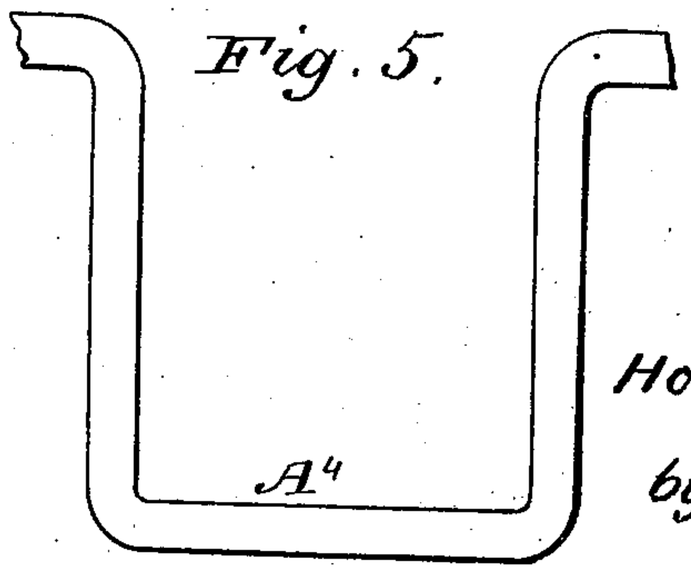


Fig. 5.



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H. TUTTLE.

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No. 547,699. Patented Oct. 8, 1895.

Fig 6.

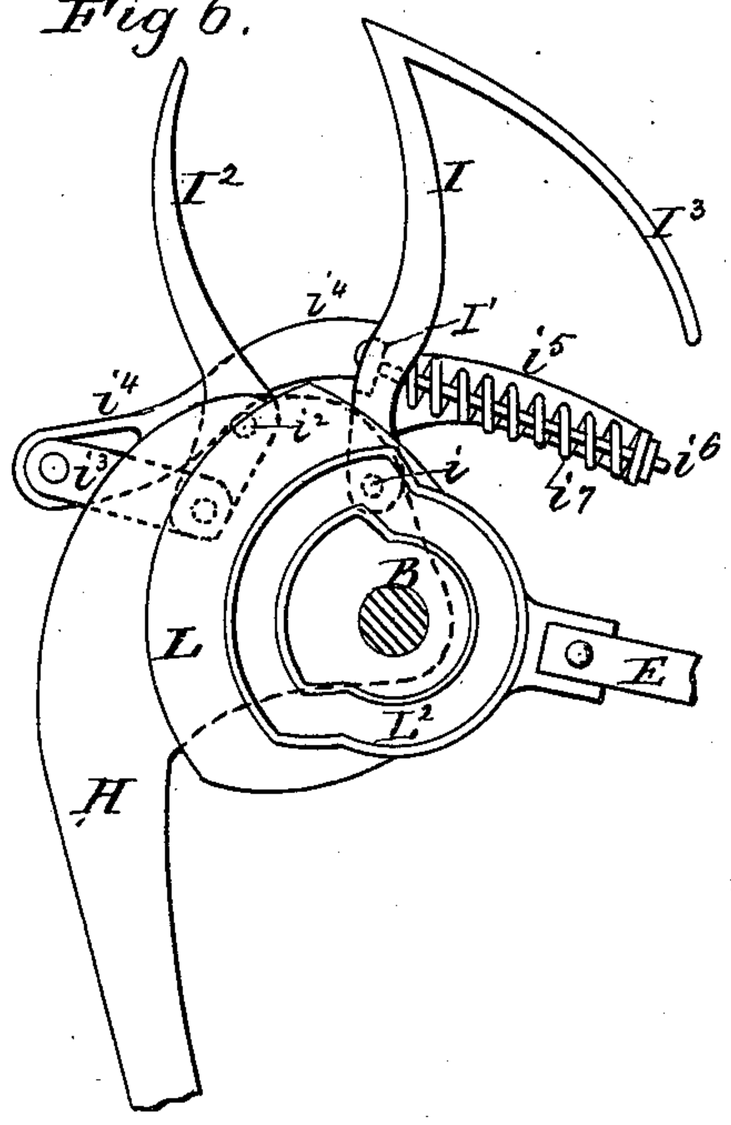


Fig. 7.

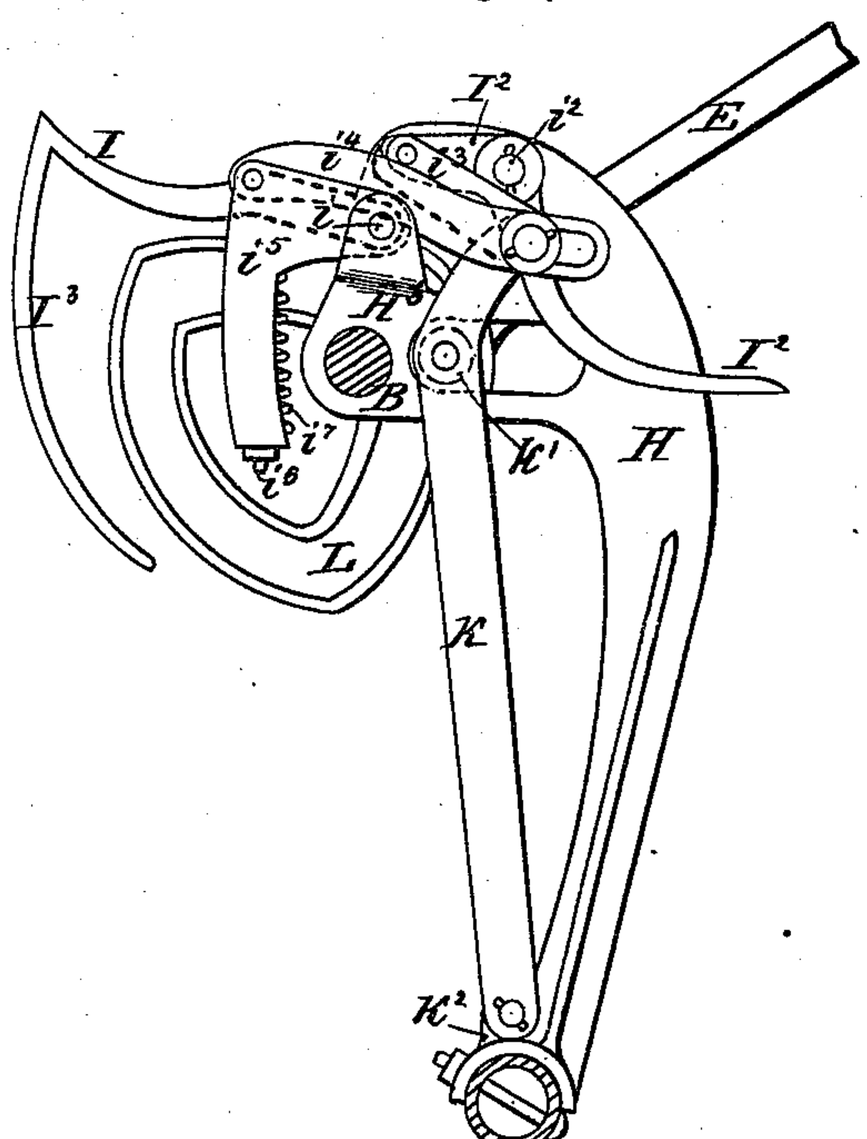


Fig. 8a

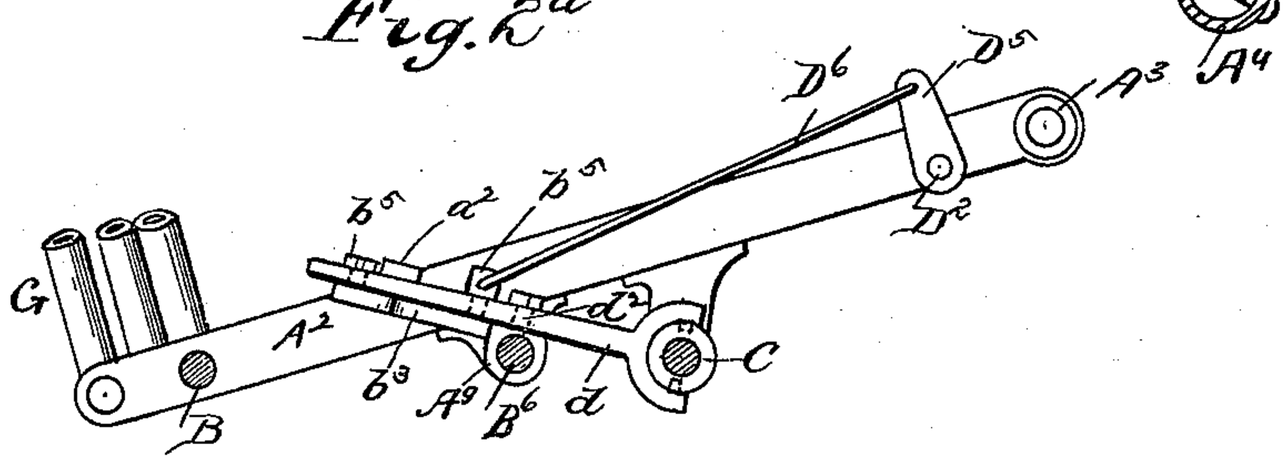
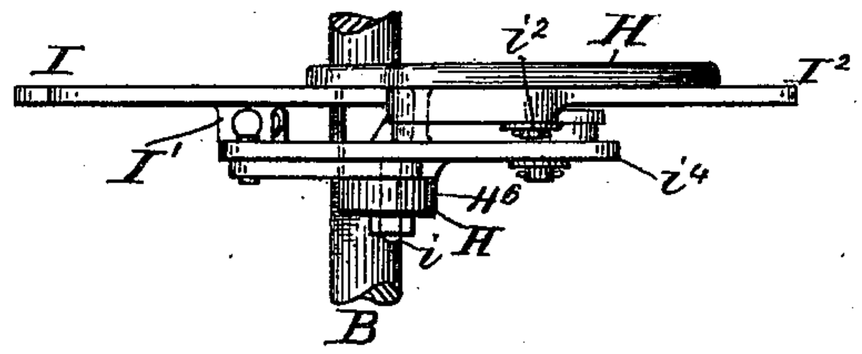


Fig. 8.



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H. TUTTLE.

GRAIN BINDER.

No. 547,699. Patented Oct. 8, 1895.

Fig. 9.

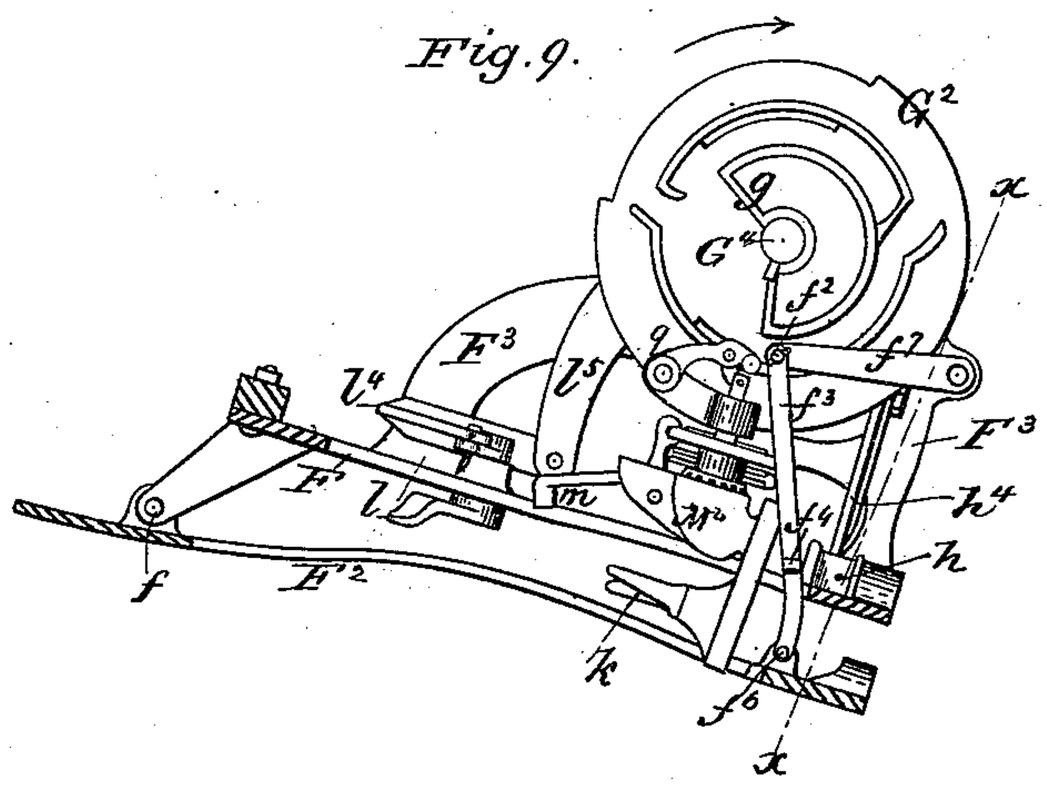


Fig. 10.

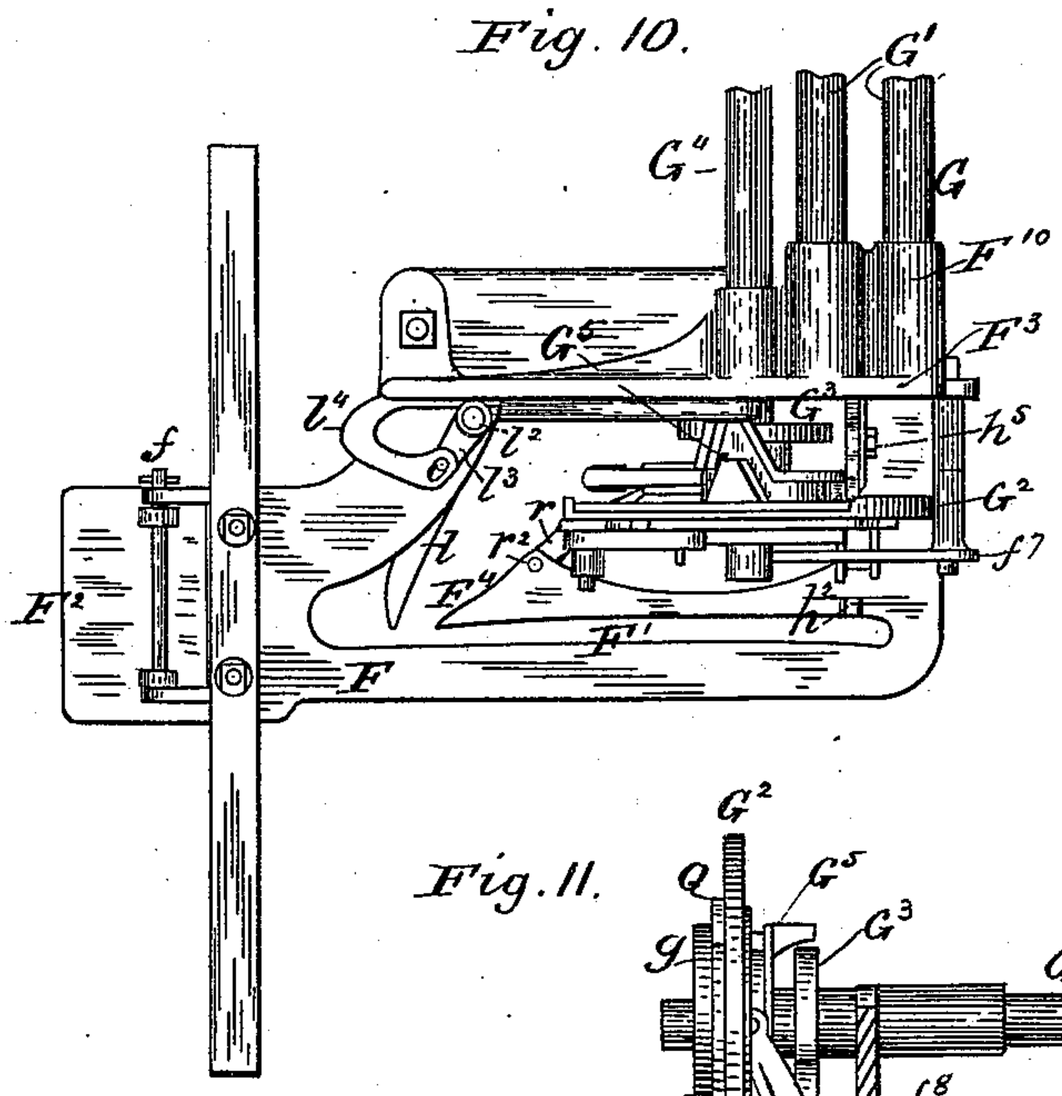
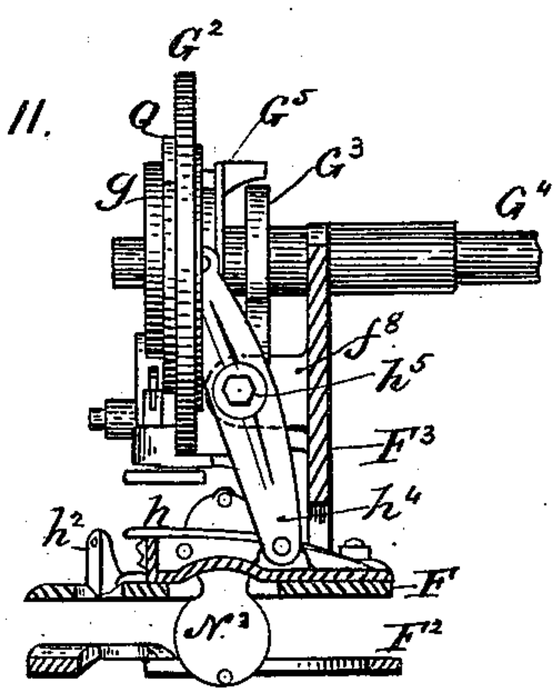


Fig. 11.



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H. TUTTLE.

GRAIN BINDER.

No. 547,699. Patented Oct. 8, 1895.

Fig. 12.

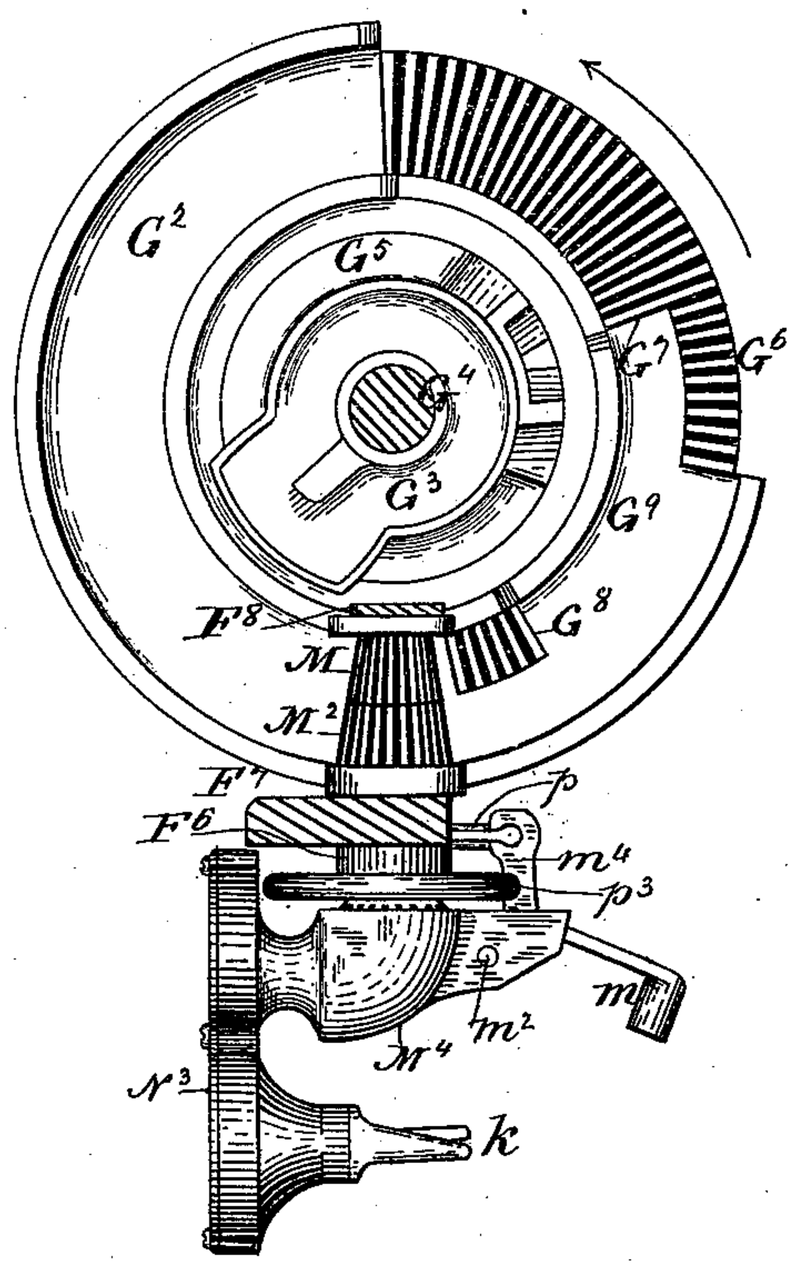


Fig. 13.

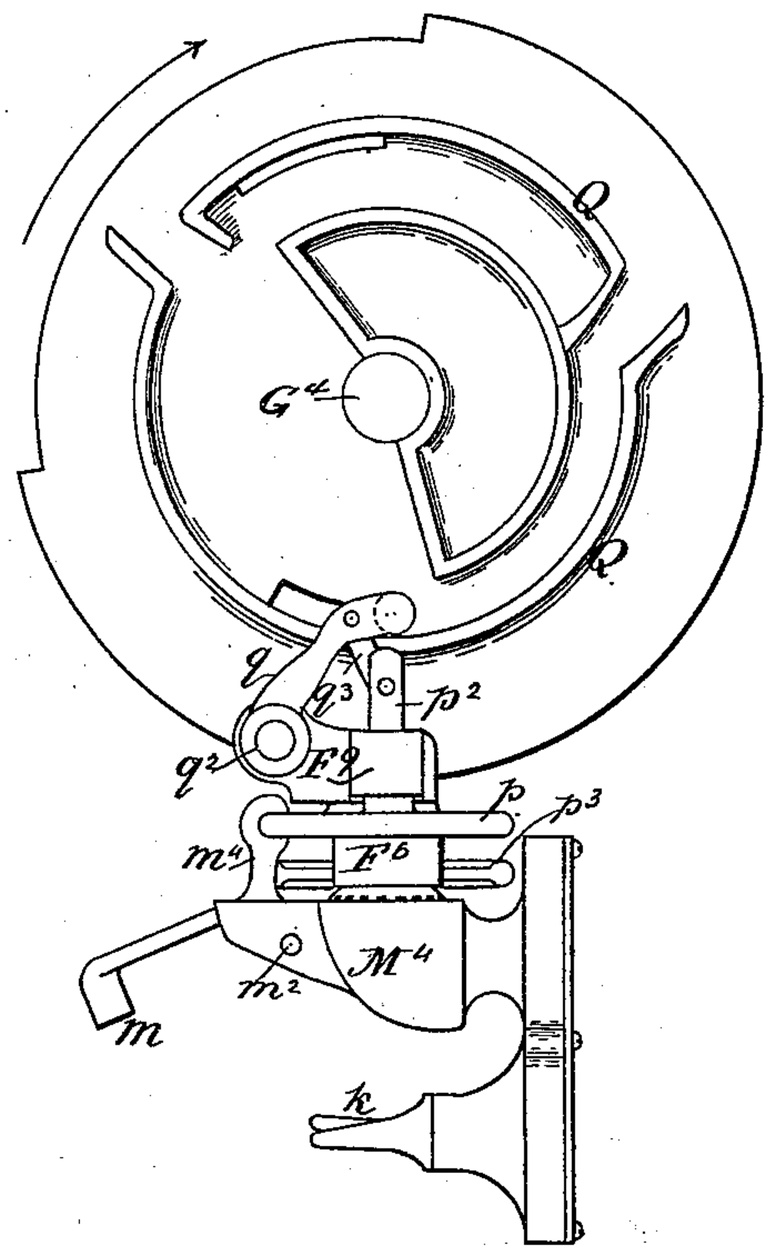


Fig. 16.

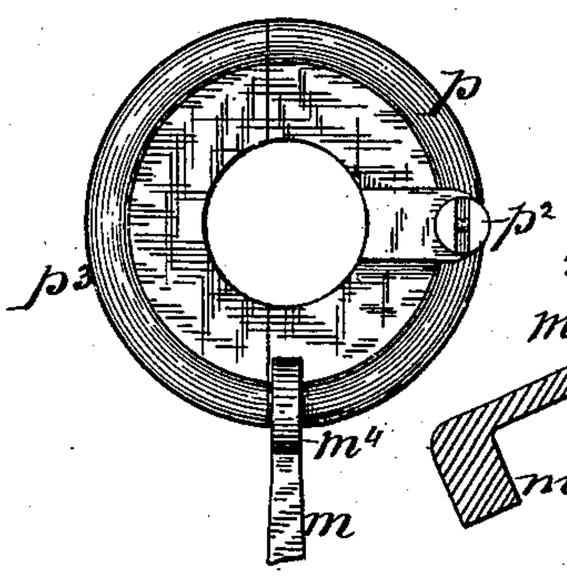


Fig. 15.

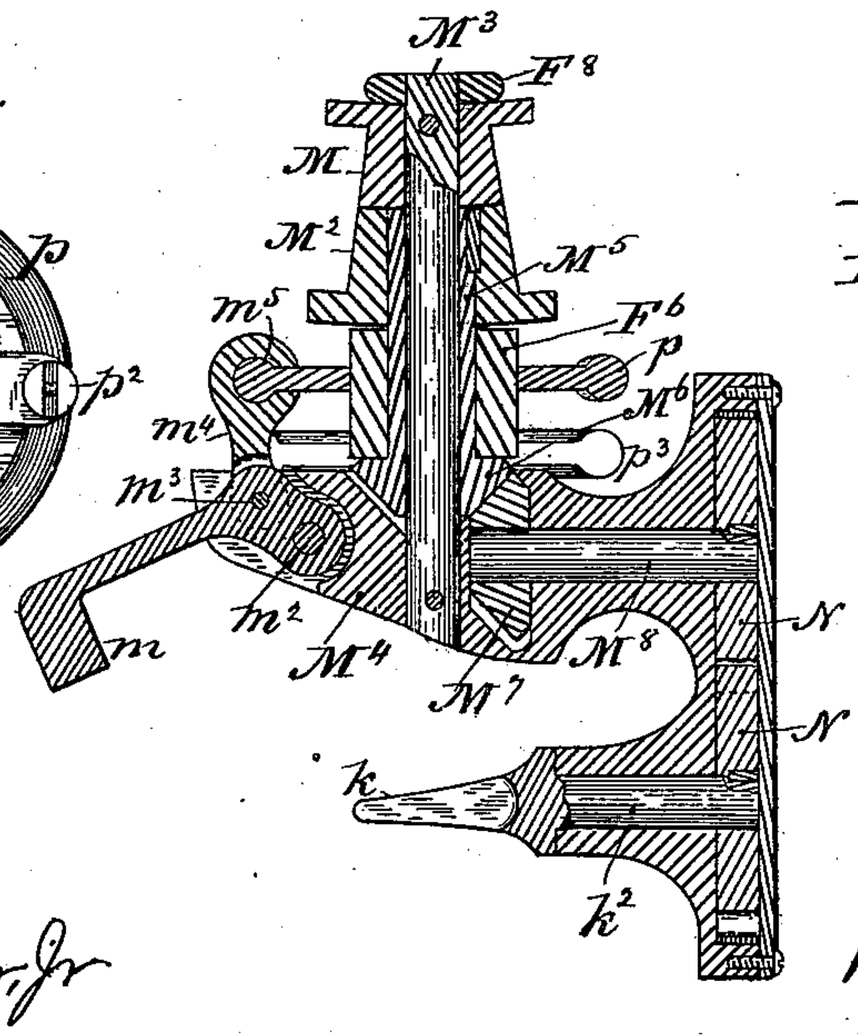
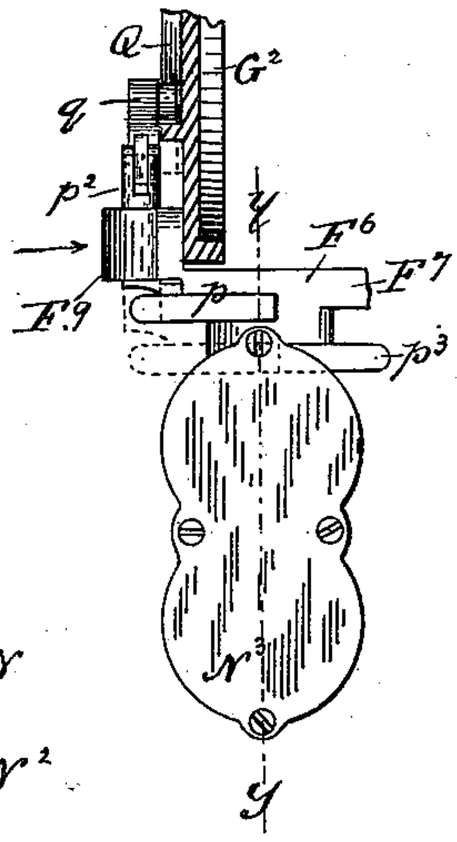


Fig. 14.



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UNITED STATES PATENT OFFICE.

HOSMER TUTTLE, OF CEDAR RAPIDS, IOWA.

GRAIN-BINDER.

SPECIFICATION forming part of Letters Patent No. 547,699, dated October 8, 1895.

Application filed May 19, 1890. Serial No. 352,382. (No model.)

To all whom it may concern:

Be it known that I, HOSMER TUTTLE, a citizen of the United States, residing at Cedar Rapids, in the county of Linn, State of Iowa, 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.

This invention relates to improvements in straw-band grain-binders; and the objects of my improvement are to produce a simple and effective mechanism for tying gavels of grain with straw, as will be hereinafter described, and specifically set forth in the claims. I accomplish these objects by the construction illustrated in the accompanying drawings, in which—

Figure 1 is a top view of the frame of a grain-binder constructed in accordance with my invention, the knotter-frame and the binder-platform being removed to clearly show the operating mechanism thereunder. Fig. 1^a is a bottom view of the double crank-lever of the band-pulling mechanism. Fig. 1^b is a top view of the clutch-latch and of the stop and releasing lugs therefor projecting from the side of a gear-wheel. Fig. 1^c is a section of a portion of said gear wheel with the latch-releasing lug in elevation. Fig. 1^d is a side view of the clutch-lever and its latch. Fig. 2 is an end view of the same mechanism and also of the knotter-frame and its mechanism. Fig. 2^a is a vertical section on line *y y* of Fig. 1, showing the clutch-lever and its latch in elevation. Fig. 3 is a transverse section of the binder-platform, showing the bundle-elevator in side view. Fig. 4 is a longitudinal section through the needle-shaft and bundle-elevating cam. Fig. 5 is a front view of the central portion of the frame to support the compressors and the needle-driving mechanism. Fig. 6 is a side view of the bundle-compressors closed and of the cam to operate the band-pulling mechanism. Fig. 7 is a side view of the compressors shown open and of the cam through which they are operated. Fig. 8 is a top view of the compressors shown open. Fig. 9 is a side view of the inner side of the knotter mechanism. Fig. 10 is a top view of the knotter mechanism. Fig. 11 is a vertical section of the knotter mechanism on line *x x* of Fig. 9. Fig. 12 is a side view of the outer side of the knotter mechanism. Fig. 13 is a side view of the inner side of the knotter mechanism. Fig. 14 is an end view of a portion of the knotter mechanism. Fig. 15 is a vertical central section of the twister and tucker portions of the knotter mechanism on line *y y* of Fig. 14 and looking in the direction of the arrow in said figure. Fig. 16 is a top view of a circular plate in two unequal parts, the smaller part to be secured to the knotter-box and remain stationary, and the larger part to be secured to a vertically-movable stud to operate a pivoted finger adapted to enter between the branches of the knotter-fork and hold the band therein while said band is twisted and tucked.

In said drawings, A represents the binder-platform timbers, and A^2 the metal beams of said platform. Said timbers and beams are an improvement upon those shown in my application, Serial No. 278,715, and are secured at one end to the tubular rod A^3 and at the other to the tubular rod A^4, and to the latter rod are secured the bearings A^5 for the needle-shaft B, which is for convenience made in two lengths united together at their crank end B^2 by the crank-pin *b*. One end of the needle-shaft passes through a sleeve B^3, that is retained in boxings in one end of the metal beams A^2. The rod A^3 is secured to the binder-frame by hooks A^6 in the usual manner, and the outer end of the platform is supported by the brace A^7, bearing against the rod A^4, and the brace A^8, bearing against the sleeve B^3. The timbers A and beams A^2 also carry the bearings for the driving-shaft C under said timbers and beams. Upon the end of the driving-shaft is placed a pinion C^2, loosely mounted thereon, and secured to said shaft is a member C^3 of a clutch, adapted to engage with a second member on the side of the pinion. This pinion gives motion to a gear-wheel B^4 on the needle-shaft by means of the idler gear-wheel B^5, mounted upon a shaft B^6, having its inner end in a bearing A^9, projecting laterally from the bottom of the outer beam A^2 and its outer end received in a strap B^7, mounted upon the ends of the shafts B and C.

The binder is shown in Fig. 1 with its parts in the position they occupy just after a bundle is ejected. The pinion C^2 is then out of

clutch with the driving-shaft, and the gear-wheel B^4 is locked by means of a lug b', projecting laterally from one of the spokes of said wheel at a short distance from its rim, coming into engagement with the under side of a latch b^3, which is connected with the trip-lever D; but just before coming into engagement a pin b^2, having its upper surface beveled outwardly and located alongside of the lug b' between the latter and the rim of the gear-wheel, enters the notch b^4 in the latch b^3 and pushes the latter sidewise toward the beam A^2, and as said latch is carried by the clutch-lever d one end of said lever will be pushed toward the beam A^2, while its opposite end, carrying the clutch-fork, will force the pinion C^2 out of clutch toward its operating-spring C^5 and stop the mechanism. The latch b^3 is retained on the under side of the lever d by means of two headed pins or bolts b^5, passing through slots in said lever, the heads of said pins extending beyond the edges of said slots. The lever d is pivoted at d^2 to the top of the bearing A^9, so that although it can be rocked horizontally it cannot be moved endwise, and to prevent its outer end from being lifted by the lug b of the wheel B^4, pressing under the end of the latch b^3, a lug a^2, projecting from the side of the beam A^2, sustains all the pressure.

To connect the stop-motion or cut-off above described with the trip-lever D, the latter, although located alongside of the needle, has one end secured upon a shaft D^2, capable of rocking in its bearings secured to the under side of the beams A^2. Said shaft has a tendency to revolve and keep the outer end of the trip-lever elevated under the impulse of a spring D^3, coiled around said shaft and having one end secured thereto and the other end adjustably retained between a pair of pins of a circular row projecting from the side of a plate D^4, secured to the side of the beam A^2, and the size of the bundle desired to start the trip can thus be regulated. Upon the outer end of the shaft D^2 is secured a crank-arm D^5, carrying one end of a connecting-rod D^6, which has its opposite end pivoted to one of the pins b^5 of the latch, so that when a sufficient amount of grain is resting upon the trip-lever and depresses it the crank-arm D^5 and rod D^6 push the latch b^3 out of engagement with the lug b of the wheel B^4 and the spring C^5 slides the pinion C^2 upon its shaft and maintains its member of the clutch in engagement with its mate and the whole binding mechanism is started and operated until again arrested, as above stated.

Upon the needle-shaft alongside of the needle B′ is secured a crank-arm B^8 to lift the bundle-elevator a^3, Fig. 3, at the time that the tuck is made on the ends of the grain-band. The elevator has its inner end pivoted at a^4 to a lug a^5, pendent from the under side of the binder-platform a. The opposite end of the elevator has a pendent arm a^6, preferably grooved in the lower end to steady it when in engagement with the crank-arm B^8.

The compressor is operated substantially as previously described in an application for patent filed by me September 18, 1889, Serial No. 324,330, but its supporting means are of different construction. The inner jaw I has its lower end pivoted to the casting H by means of the pin i, having one of its ends retained in the lug H^6 of said casting and the other end in the body of the casting H; but the outer jaw I^2 has its pivot-pin i^2 at a point higher than the pivot-pin i. The jaws are operated from the upper end of a lever K, having its lower end pivoted to a lug K^2, projecting from the bottom of the casting H. To control the upper end of the lever K, it has a roller k', mounted upon a pin projecting from its side, and said roller travels in and is controlled by a cam L, mounted upon the needle-shaft B. The upper end of the lever K is connected with the lower end of the extension of the jaw I^2 by the connecting-rod i^3; but the upper end of the lever K is yieldingly connected with the jaw I at a point higher than its pivot i, so as to render said jaw yielding to receive and operate upon bundles of different sizes. For this purpose there is also pivoted to the upper end of the lever K a connecting-rod i^4, that unites it to one arm of a bell-crank lever i^5, and said lever is pivoted to the casting H by means of the pivot-bolt i. The other arm of the bell-crank lever has its free end bent laterally toward the jaw I and is yieldingly connected thereto by means of a bolt i^6, passing loosely through said bent end and through a lug I′, Fig. 8, projecting laterally from the jaw I, and a spring i^7, placed upon the bolt i^6 and having one of its ends pressing against the bent end of the bell-crank lever and the other end against the lug I′. The inner jaw I has a tail or guard I^3 extending from its point to arrest the grain and prevent it from lodging under the jaw I during the operation for opening it while the previously made and tied bundle is discharged.

To properly support the compressor mechanism and the needle-operating mechanism, and thus relieve the needle-shaft, the tubular rod A^4 is bent down into U shape about the middle of its length, as shown in Fig. 5, and upon the lower portion of said bent part the lower end of the casting H is mounted and secured. The outer edge of this casting is convex to act as a stripper for the discharger E, secured to the cam L, a casting H^2, of substantially the same form in outline as the casting H, being placed alongside of the second discharger E, secured to the shaft B. To the shaft-supporting castings H and H^2 are also pivoted the links t^2 of the packers T. Between the castings H and H^2 there is also mounted upon the U-shaped portion of the rod A^4 a cast brace H^3 to support the needle-shaft adjacent to the needle and crank upon

said shaft and to support the levers of the needle mechanism; but said packers and needle mechanism form no part of this invention.

To control the band-pulling mechanism, a double crank-lever *e* is pivoted at e^2, Fig. 1, in a sleeve on the under side of the beam A^2. The upper arm of said double crank carries at its upper end a roller to travel in its grooved operating-cam L^2, Figs. 1 and 6, and the lower arm carries at its lower end a connecting-rod e^3, that unites it to the pendent arm of a bell-crank lever e^4, that is pivoted loosely upon the driving-shaft C. The upper arm of said lever carries in suitable bearings a short shaft e^5, upon the outer end of which is mounted a wheel e^6, having cogs or serrations upon its periphery to produce at suitable time the desired friction upon the straw band to advance it, the latter being supported by a roller e^7, mounted in a metal frame e^8, suspended from the tubular rod A^3 of the frame.

The breast-plate consists of an upper plate F and a lower plate F^2. The plate F is secured to the casting F^3, and the latter is carried by the U-shaped frame G. The plate F has a slot F′ extending nearly the whole length thereof, on one side of which there is a point F^4, where another slot diverges therefrom. These parts are nearly similar in form, but differ in construction from those shown in the pending application, Serial No. 278,715.

To hold the bundle a sufficient distance from the knotter while the needle-arm is passing the band around the bundle to allow a sufficient amount of slack on the band to make the knot, the lower plate F^2 is used. Said plate is hinged at its inner end to lugs under the plate F at *f* and is longitudinally slotted for the passage of the needle. The outer end of the plate F^2 is controlled by the bundle to elevate it and by roller f^2 to positively depress it in traveling against the periphery of a cam *g*, projecting from the back of the mutilated gear G^2, which controls all the movements of the knotting mechanism. The roller f^2 is at the end of a connecting-rod f^3, that has its lower end pivoted to a lug f^6, projecting from the outer end of the plate F^2. When the latter is not elevated by the bundle, it drops by its own weight until a lug f^4 on the side of the rod f^3 rests upon the plate F, as the cam *g* is simply a cam operating by its outer periphery. The roller f^2 is retained in proper relation with the cam by means of the brace f^7, having its outer end pivoted to the frame F^3.

To operate the knotter mechanism, one end of the band is first passed from the band-making mechanism through the eye of the needle to the grasper *h*, Figs. 9 and 11, and hereinafter described, where the end of the band is retained. The bight of the band is then depressed into the knotter-fork by the flow of the grain, and a sufficient amount being received the eye end of the needle is elevated and encircles the bundle with the band, and as said band is along the inner side of the body of the needle which travels in the slot F′ the band passes along the inner side of the dividing point F^4 in the plate F. The band-leading lever *l* then pushes the band between the branches of the knotter-fork *k*, where it is retained by the band-holding lever *m*, the lower end of which enters between said branches, and then the second end of the band being cut and retained by the grasper and the lever *m* retracted the knotter-fork is swung in a circle to twist the ends of the band together, and afterward swung on its axis, the ends of the band are thereby tucked under the band.

The band-leading lever *l* is located under the plate F and has at one end a stud l^2, that passes through said plate and a boss thereon. Upon said stud is secured an arm l^3, having at its end a pin that passes through a slot in the bent end of a connecting-rod l^4, and the opposite end of said rod is pivoted to the lower end of a lever l^5. Said lever is pivoted to the cast frame F^3 at l^6, Fig. 2, and has at its upper end a roller (not shown) to travel in the cam G^3, mounted upon the shaft G^4 of the knotter mechanism, and said shaft carries a sprocket-wheel L^4, around which passes a chain L^5, that passes also around a sprocket-wheel L^6 upon the needle-shaft, from which to receive its motion.

The band grasper and cutter consist of a post h^2, projecting up from the plate F and carrying a stationary blade alongside thereof, and the horizontally-reciprocating grasper *h*, carrying a blade. (Shown by the serrated edge in Fig. 11.) Said grasper has pivoted to its top at h^3 one end of a lever h^4, that is pivoted at h^5 to a lug f^8, projecting from the cast frame F^3, and the opposite end of said lever has a roller to travel in its operating-cam G^5 on the face of the mutilated gear G^2, so that the grasper is operated by said lever h^4 and its cam G^5. Said gear has a segmental outer row of cogs G^6 and has an inner row G^7, and alongside of said cam are mounted two pinions M and M^2 to rotate the knotter-fork *k* first in a circle and then upon its own axis. Said pinions have their shafts retained in a knotter-box F^6, connected by an arm F^7 and also an arm F^8 with the cast frame F^3.

The pinion M is pinned to one end of the central shaft M^3 of the knotter, and the opposite end of said shaft carries pinned thereto the frame M^4, in which bearings are provided for the shaft of the knotter-fork and its operating-gears. The twister consists of the frame M^4, Figs. 12, 13, and 15, that is suspended from the lower end of the shaft M^3, and the latter is carried by the knotter-box F^6, upon which the pinions M and M^2 rest. Immediately after the band-holding lever *m* has entered between the branches of the knotter-fork the double row of cogs on the face of the mutilated gear begins to engage with the two pinions M M^2 of the knotter and revolve

them in the same direction and with the same speed and cause the knotter-fork to revolve on its own axis and wind the ends of the band around it about one turn and a half, and also cause said knotter-fork to revolve in a horizontal circle. After the end of the segment of teeth G^7 has been reached the pinion M^2 continues to revolve on account of its engagement with the longer segment of teeth G^6 upon the mutilated gear; but the pinion M remains stationary, and this causes the knotter-fork to revolve upon its own axis and form the tuck of the knot under the band. The blank space left at G^9 between the end of the segment G^7 and the small segment of teeth G^8 is to give time for the bundle to be discharged from the knotter-fork by the dischargers, and the small segment of teeth G^8 is to revolve the knotter-fork in a circle to the position it must occupy to receive a new band.

To cause the knotter-fork to occupy a position on the axis of a line passing through the center of the shaft M^3 of the knotter, so that the center of the knotter-fork will swing around on said axis and produce an equal strain upon both ends of the grain-band, the frame M^4 is extended on one side of the axis of the shaft M^3 and a revolving motion is given to the axle of the knotter-fork, as follows: The pinion M^2 is secured to the upper end of a sleeve M^5, having upon its lower end a bevel-pinion M^6, which meshes with a pinion M^7 upon a shaft M^8 in a bearing in the frame M^4, and said shaft carries on its outer end a gear-wheel N, which meshes with a similar gear N^2 upon the shaft k^2 of the knotter-fork. These gears are inclosed in the frame M^4 by a cap-plate N^3, secured to said frame.

To cause the lower end of the band-holding lever m to be tipped down into the knotter-fork, its upper end is pivoted to the frame M^4 at m^2 and carries pivoted thereto at m^3 a link m^4, having on one side a recessed groove m^5 to receive the enlarged edge of a segment p of a ring. Said segment is a little more than a half-circle and has a central segmental perforation to fit loosely around the knotter-box F^6. The segment p is carried vertically up and down by a stud p^2 integral therewith, but recessed at its lower end to permit the passage of the head of the link m^4 around the edge of the segment p. The stud p^2 is guided in a perforation made vertically in a lug F^9, Fig. 14, projecting from the side of the knotter-box. To reciprocate the stud p^2 vertically, a lever q is pivoted at q^2 to the lug F^9 and has its upper end provided with a roller to travel in the groove or against a cam Q on the back of the mutilated gear, the lever q being united to the stud p^2 by means of a connecting-link q^3.

To complete the segment p and form therewith a ring for the link m^4 to travel upon and rotate with the knotter when the lower end of the holding-lever m is in engagement with the knotter-fork, a second segment p^3 is secured to the bottom of the knotter-box or made integral therewith, so that when the segment p is lowered to the level of the segment p^3 a complete circular track is produced to guide the link m^4 and retain the lower end m of the band-holding lever in the knotter-fork while the ends of said band are twisted together and tucked under the band.

To permit the knotting mechanism to be swung in a circle in the large opening formed in the breast-plate F, but at the same time permit the point F^4 in said plate to guide the grain-band to the knotter-fork, a latch r is pivoted at r^2 to said breast-plate and adapted to swing horizontally out of the way when the casing of the gears N N^2 of the knotter strikes against it, and the latch is returned to normal position by the grain-band sliding against the point F^4 and against the outer edge of said latch on its way to the knotter-fork.

The frame to support the frame F^3, carrying the breast-plate, the knotting mechanism, and its driving-shaft G^4, consists, mainly, of three wrought-iron tubes G and two horizontal tubes G′. The lower ends of the tube G are inserted in sockets in the large sleeve end A′ of the outer beam A^2 and have their upper ends inserted in webbed elbows S, which are provided on one side with a bracket (shown by a dotted segment of a circle in Fig. 2) to support one end of the shaft G^4. In said elbows is also inserted in a horizontal position one end of the tube G′, while the opposite end is secured in tubular sockets F^{10}, projecting from the inner side of the breast-plate carrying frame F^3.

Having now fully described my invention, I claim—

1. The combination of the driving shaft of a grain binding apparatus, a pinion and clutch upon said shaft, the needle shaft, parallel with the driving shaft and having a gear-wheel thereon, a stop lug b and pin b^2 projecting from said gear wheel and an intermediate gear connecting said gear-wheel and pinion, a pivoted clutch lever, and a sliding latch carried by said lever and having a notched end adapted to engage with the gear-wheel on the needle shaft substantially as described.

2. The combination of a grain binder platform, a pivoted trip lever passing up through said platform, the trip lever pivot-shaft located under the platform, and an adjustable spring upon said shaft, a crank arm upon said shaft, a longitudinally slotted clutch lever, a sliding latch carried by said lever, a connecting rod uniting said latch to the trip-lever pivot-shaft, a clutch on the operating shaft and the wheel B^4 having a projecting lug to engage with the sliding latch as described for starting and stopping the needle shaft substantially as described.

3. The combination of the driving shaft, a clutch, a pinion, and a spring upon said shaft, the needle-shaft and its gear provided with a stop lug, a clutch lever and a longitudinally sliding latch carried thereby and adapted to engage with said stop, and means as described

for connecting said latch with a trip lever pivoted under the grain-binder platform substantially as described.

4. The combination of the needle shaft of a grain binding apparatus, the rod A^4 on the side thereof having a downward U shaped bend opposite the path of the bundle dischargers, and the cast supports H H^2 having one end resting upon said downward bend of the rod A^4 and the other end receiving the needle shaft substantially as described.

5. The combination of the trip lever D having its pivot shaft D^2 under the grain binding platform, a crank at the end of said shaft and a longitudinally sliding latch connected therewith, a clutch, and a clutch lever carrying said latch a gear B^4 having a lug to engage with said latch, the needle-shaft carrying said gear, and a sprocket wheel, a sprocket wheel upon the shaft of the knotting mechanism, and a chain uniting said sprocket wheels substantially as and for the purpose described.

6. In combination with the shaft M^3 and sleeve M^5 of a knotting mechanism, and means substantially as described for intermittently rotating them, a knotter fork located in the axis of said shaft and adapted to be swung in a circle, and then on its own axis, said knotter fork having its shaft in the frame M^4 containing gear wheels N and N^2 whereby a twist and a tuck of a grain band are produced substantially as described.

7. In a grain binder, a knotter fork so mounted relatively to the axis of the knotter mechanism as to have its center on said axis and its own shaft at right angles thereto, in combination with operating means substantially as described to swing said knotter fork in a circle having said axis for a center and also to rotate it on its own axis, substantially as described.

8. The combination of the axis shaft M^3 and knotter frame M^4 secured thereto, the sleeve M^5 having a bevel pinion thereon, and means substantially as described to intermittently revolve said shaft and sleeve, with the pinion M^7, gears N and N^2 mounted on shafts carried by the knotter frame and the knotter fork substantially as described.

9. The combination of the shaft M^3, the frame M^4 secured thereto, and the rotatable knotter fork, with the band holding lever *m* pivoted to said frame and having one end adapted to enter between the branches of said knotter fork substantially as described.

10. The combination of the shaft M^3 sleeve M^5, and knotter box F^6 having the segmental ring p^3 secured thereto with the vertically movable segmental ring *p*, the band holding lever and a link uniting said lever with the ring constructed in segments substantially as described.

11. The combination of the platform supporting outer beam A^2 having an enlarged sleeve end A′ provided with three perforations, webbed elbows S, and three tubes uniting them with the breast plate carrying-frame provided with tubular sockets F′ and two tubes G′ uniting them to the webbed elbows substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

HOSMER TUTTLE.

Witnesses:
E. E. MASSON,
C. C. SCHILLER, Jr.