No. 708,002. Patented Sept. 2, 1902.

J. F. APPLEBY.

AUTOMATIC GRAIN BINDER.

(Application filed Sept. 11, 1901.)

(No Model.) 4 Sheets—Sheet 1.

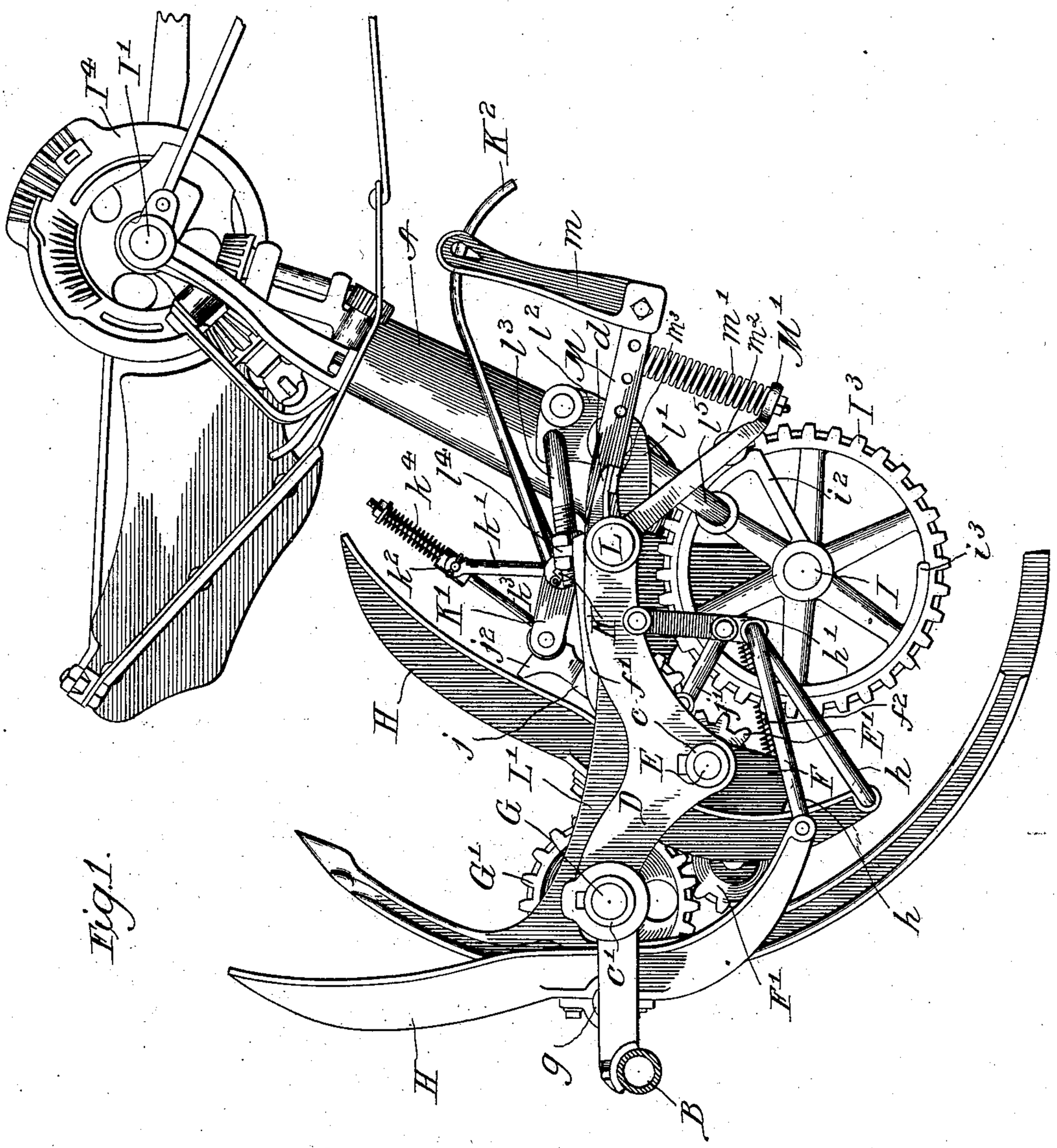

Fig. 1.

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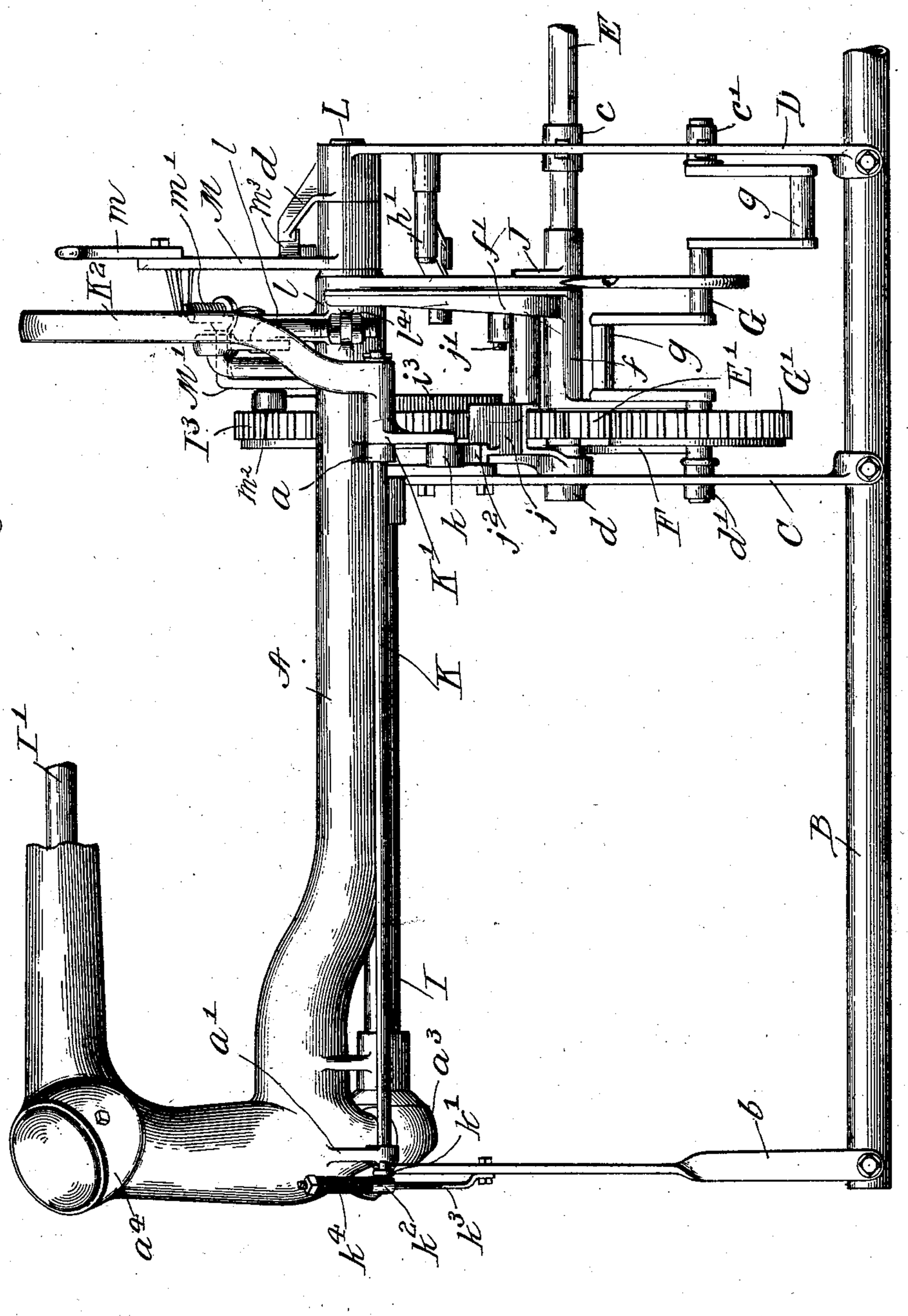
(No Model.) 4 Sheets—Sheet 2.

Fig. 2



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(No Model.) 4 Sheets—Sheet 3.

Fig. 3

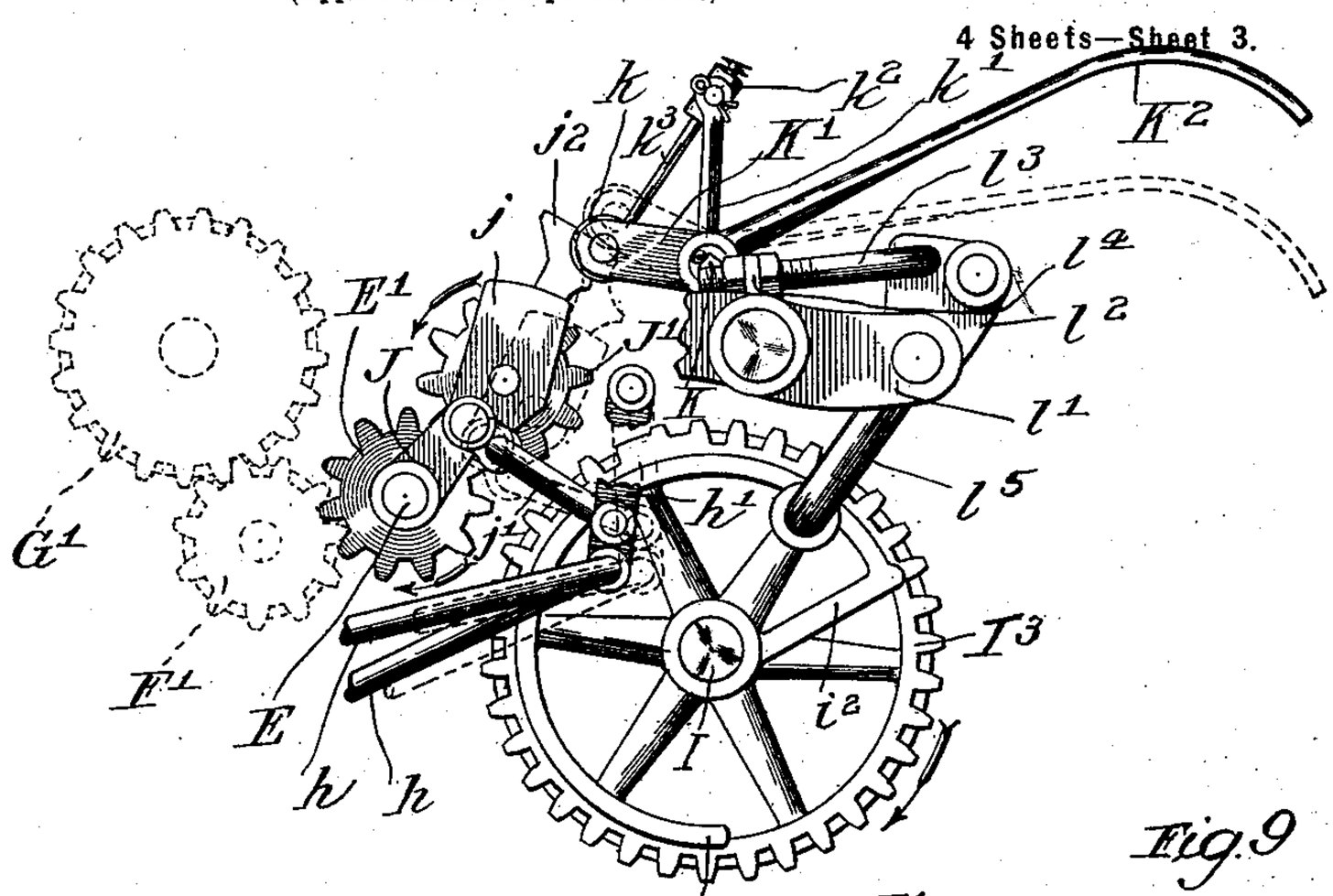

Fig. 4

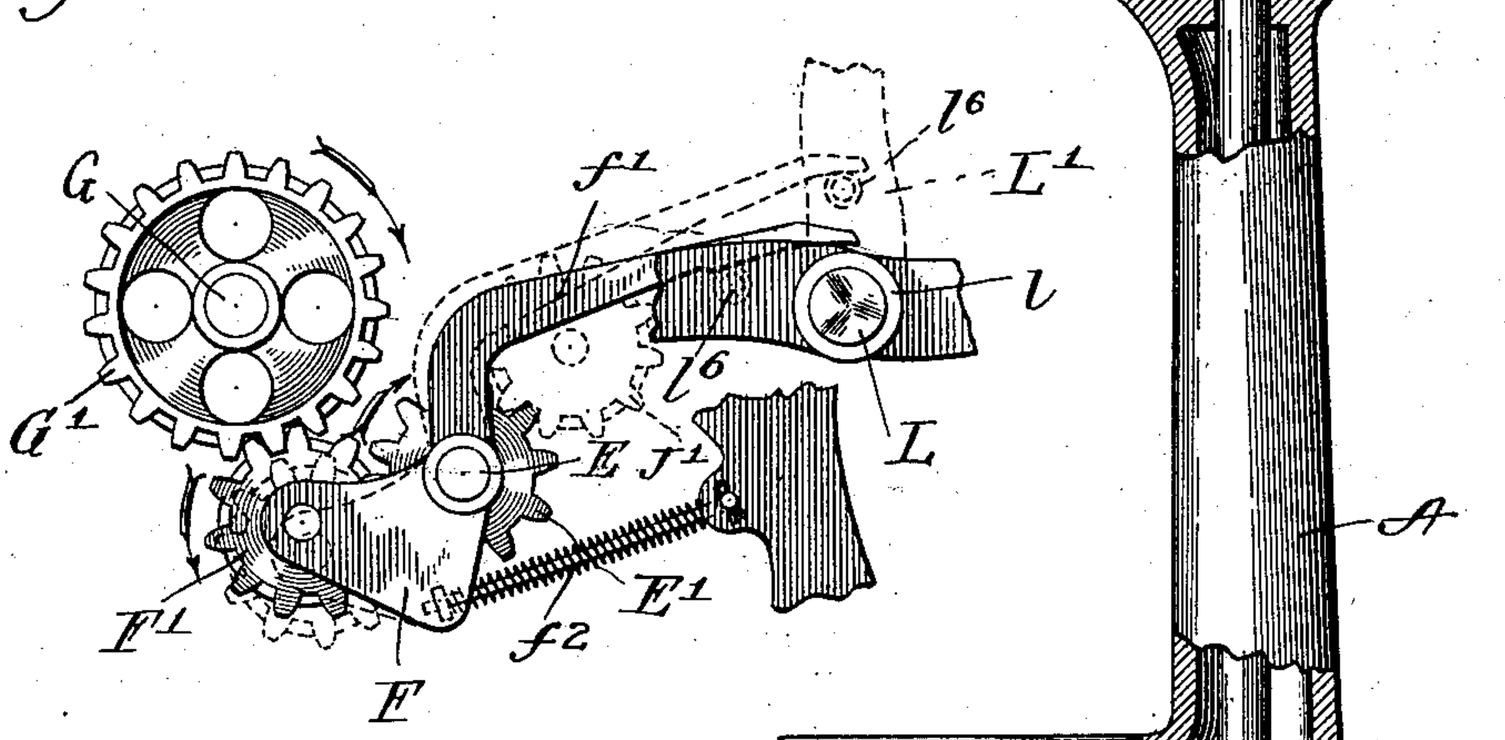

Fig. 9

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(No Model.) 4 Sheets—Sheet 4.

Fig. 5

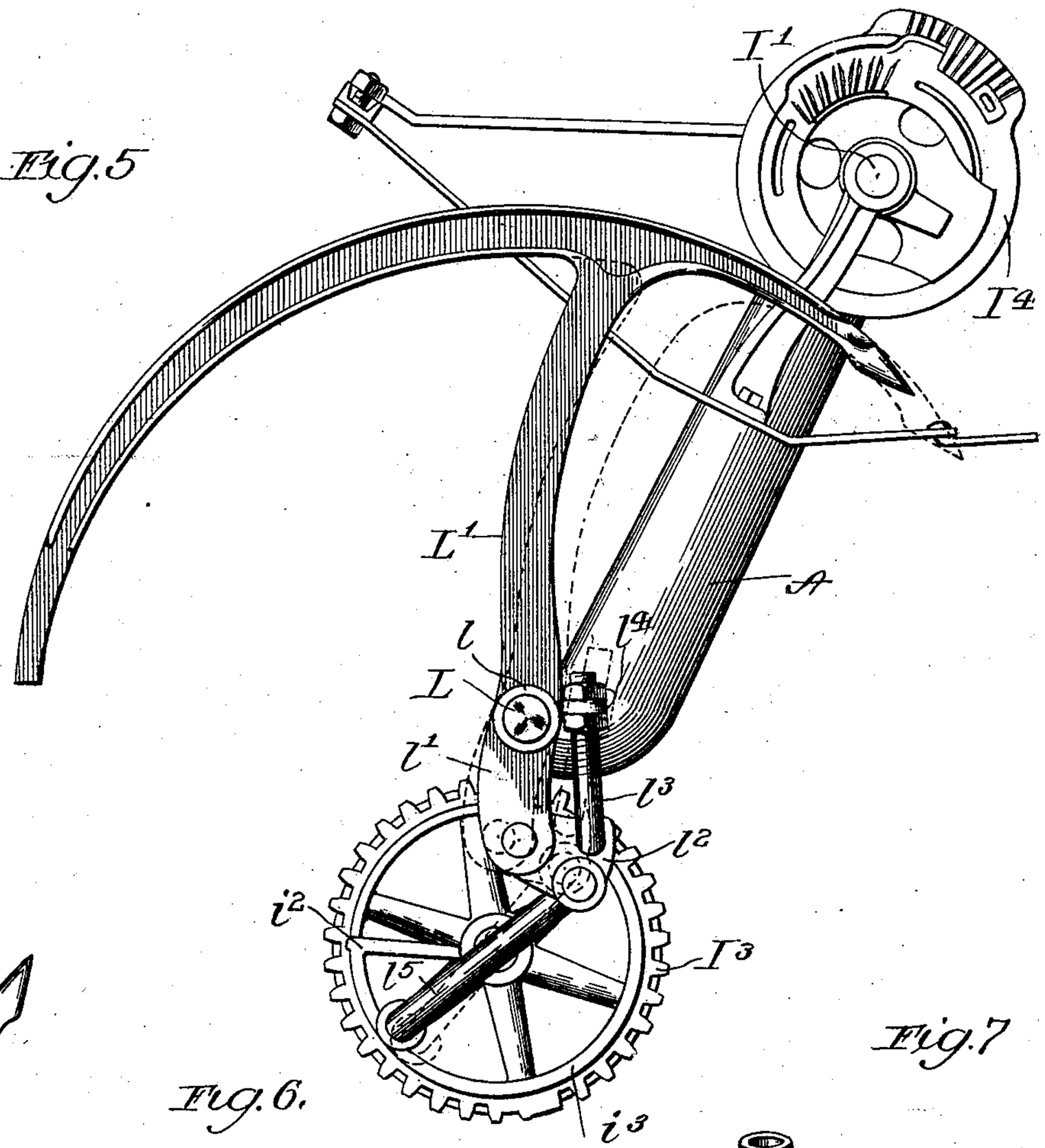


Fig. 6.

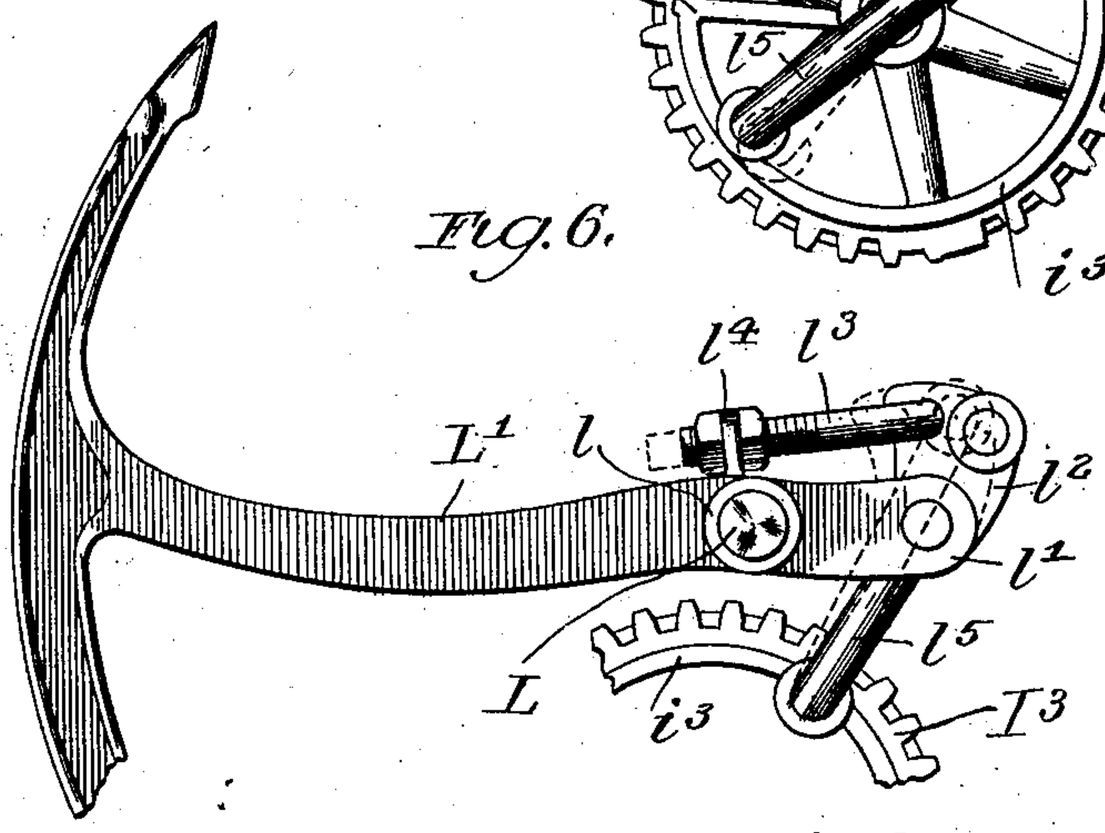
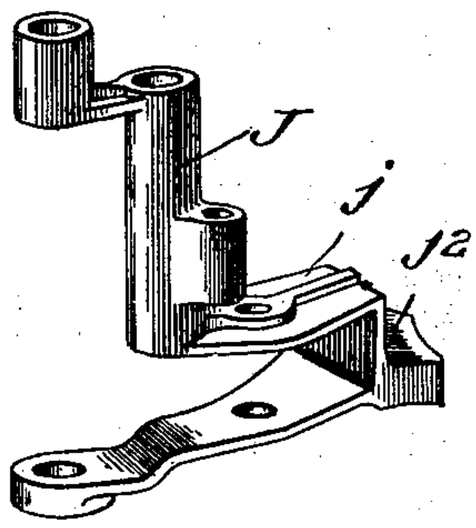
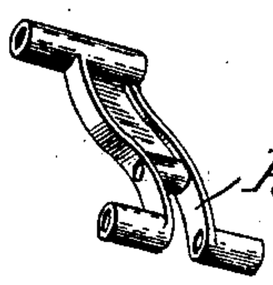


Fig. 8.

Fig. 7





Witnesses;
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Chas. M. Chamberlin.

Inventor
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UNITED STATES PATENT OFFICE.

JOHN F. APPLEBY, OF CHICAGO, ILLINOIS.

AUTOMATIC GRAIN-BINDER.

SPECIFICATION forming part of Letters Patent No. 708,002, dated September 2, 1902.

Application filed September 11, 1901. Serial No. 75,007. (No model.)

To all whom it may concern:

Be it known that I, JOHN F. APPLEBY, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Automatic Grain-Binders, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

My invention relates to automatic grain-binders, and more especially to the driving-gearing.

It has for its object to provide means for causing the binding and packing mechanisms to intermit alternately in their operation and means whereby the pressure on the packers sets the binding mechanism in motion.

It has for its further object to provide means for adjusting the needle relative to the knotter without changing its relation to the deck.

In the drawings, Figure 1 is a side elevation of such parts of a grain-binder as necessary to illustrate my invention. Fig. 2 is a plan view of parts shown in Fig. 1. Fig. 3 is a detail elevation of the means for intermittently actuating the binding mechanism. Fig. 4 is a detail elevation of the means for intermittently actuating the packers. Fig. 5 is an elevation of a portion of the binding mechanism, showing the means for adjusting the needle relative to the knotter. Fig. 6 is an elevation of a portion of the parts shown in Fig. 5, showing that the relation of the needle to the deck does not change as it is adjusted relative to the knotter. Fig. 7 is a perspective view of the vibrating trip-arm. Fig. 8 is a perspective view of the packer-link support. Fig. 9 is a partial sectional view of a portion of the binder-frame, showing the bevel-gears inclosed in their cases.

The binder-frame A, the binder-pipe B, the tie *b*, and the supports C and D form the ordinary framework of an automatic grain-binder. This framework is mounted upon the harvester (not here shown) by means of suitable supports in the ordinary manner. The binder-frame A is connected to the binder-pipe B by means of the support C and the tie *b*.

In the inner end of the binder-frame A is tightly fitted the needle-shaft L. The support D is secured at one end to said needle-shaft and at the other end to the binder-pipe B.

The continuously-rotating driving-shaft E, which receives its motion from the traction-wheel through the intermediacy of the ordinary gearing, is journaled in the boxes *c* and *d* of the supports C and D. Secured to the driving-shaft E near its inner end is the spur-pinion E′, and mounted upon said driving-shaft and adapted to vibrate thereon is the vibrating hanger F. (Best shown in Figs. 2 and 4.) Journaled in the vibrating hanger F and in constant mesh with the spur-pinion E′ is the intermediate pinion F′. To the sleeve or hub *f* is secured the operating-arm *f*′, which is adapted to be engaged by a roller or cam on the needle-arm, as will be described later.

The packer-shaft G, having the packer-cranks *g* and *g*, is journaled in the self-alining boxes *c*′ and *d*′ in the supports C and D. Secured to said packer-shaft near its inner end is the spur-gear G′. Intermittent rotation is imparted to said spur-gear by the intermediate pinion F′, which is adapted to mesh intermittently therewith. Journaled upon the packer-cranks *g* and *g* are the usual packers H and H, which have their lower ends held in a definite relation to some normally fixed point by the ordinary packer-links *h* and *h*. It is customary to pivot one end of the packer-links to a fixed point in the binder-framework, but, as here shown, they are pivoted in the packer-link support *h*′, which in turn is pivoted on a stud on the support D, but which is normally held in a fixed relation with the framework of the binder. When now the pressure on the packers becomes excessive, the said packer-link support is permitted to move on its pivot, which movement is effectual in throwing the binding mechanism into gear, as will be hereinafter described.

In suitable bearings in the binder-frame A is journaled the binder driving-shaft I, through which motion is imparted to the knotter-shaft I′ through the intermediacy of the cross-shaft I^2 and the miter-gears *i* and *i* and miter-gears *i*′ and *i*′. To the knotter-shaft I′

is secured the ordinary knotter-operating wheel I^4, which actuates the knotting devices. On the inner end of said binder driving-shaft is the spur-gear I^3, provided on the outer side with the cam i^2 and the delay-surface i^3.

Mounted upon the driving-shaft E near its inner end and adapted to vibrate thereon is the trip-arm J. In the yoke j of said trip-arm is journaled the intermediate pinion J', which meshes constantly with the spur-pinion E' and is adapted to mesh intermittently with the spur-gear I^3. The trip-arm J is connected to the packer-link support h' by means of the trip-link j'. On the upper end of said trip-arm and in one part therewith is the trip-cam j^2.

Pivoted in suitable lugs a and a' of the binder-frame is the trip-shaft K. Secured to the inner end of said trip-shaft is the trip-stop K', which is provided with the antifriction-roller k, adapted normally to engage the trip-cam j^2. In one part with the trip-stop K' is the actuating-arm K^2. The outer end of the trip-shaft is provided with the crank-arm k', to which is pivoted the slide k^2. Pivotally secured to the tie b is the trip-spring rod k^3, which is adapted to move freely through the slide k^2. Upon this rod is the trip-spring k^4, one end of which bears against the slide k^2 and the other against a threaded adjusting-nut on the end of said trip-spring rod.

It will be noticed that the actuating-arm K^2 of the trip-stop is adapted to project diagonally above the deck in a position to be engaged by the grain to be bound. During the packing of the grain when the pressure on the actuating-arm produced by the packers reaches a certain point determined by the tension on the trip-spring k^4 it is pressed down against the action of said trip-spring and the trip-stop K' raised, so that its antifriction-roller is out of engagement with the trip-cam j^2. This disengagement leaves the trip-arm J free to move on its axis on the driving-shaft. The thrust on the packer-links h and h, due to the same pressure on the packers which is effectual in disengaging the trip-stop from the trip-cam, moves the packer-link support h' upon its pivot, which in turn through the agency of the trip-link j' moves the trip-arm J upon its axis, whereby the intermediate pinion J', carried thereby, is thrown into mesh with the spur-gear I^3 on the binder-shaft and the binding mechanism is actuated, as above referred to. It will be seen that the effective arm through which the force of the trip-spring acts is greater before the trip-stop is disengaged from the trip-cam than afterward. In other words, when the mechanism is tripped the trip-spring acts nearer the dead-center of the crank-arm of the trip-shaft than before. In this manner considerable pressure is required to trip the mechanism, so that the bundles may be bound tightly; but when once tripped little resistance is offered to their discharge. At a properly-timed point the spur-gear I^3 is mutilated by filling or partially filling the space between two or more teeth. When the intermediate pinion J' shall have driven said spur-gear through one revolution, one or more teeth of said intermediate pinion engage the mutilation. The proportion of said mutilation is such that when it is thus engaged said intermediate pinion is raised and the trip-arm J, in which it is mounted, moved on its axis a sufficient amount to carry the trip-cam j^2 beyond the dead-center of the antifriction-roller k of the trip-stop. Through the agency of the trip-spring k^4 said antifriction-roller is forced into its seat in said trip-cam, whereby said trip-arm is moved on its axis a sufficient additional amount to carry said intermediate pinion entirely out of mesh with said spur-gear. When said intermediate pinion is once thrown out of engagement with said spur-gear, it remains there, and said spur-gear remains at rest until sufficient pressure is again brought upon the packers, when the operation is repeated.

Journaled upon the needle-shaft L is the needle L', to the hub l of which in one part therewith is secured the arm l'. Pivoted to said arm is the adjustable bell-crank l^2, which is secured in a normally fixed position relative thereto by the adjusting-bolt l^3, with its lock-nuts engaging a lug l^4 on the needle-hub. The needle-pitman l^5 has one end pivoted in said bell-crank and the other end in the spur-gear I^3. As the spur-gear I^3 is driven through its cycle by the intermediate pinion J', thereby driving the binding mechanism, as above described, the needle L' is caused to oscillate on its shaft through the intermediacy of the needle-pitman l^5 and the adjustable bell-crank l^2, whereby the bundle is compressed and the cord carried to the knotting device in the usual manner. By means of the adjusting-bolt l^3, thereby shortening or lengthening the effective length of the arm l', the needle may be readily adjusted relative to the knotting device to compensate for variations in manufacture or for any other purpose without changing its relation to the deck, as shown in Figs. 5 and 6. Devices heretofore for adjusting the oscillation of the needle have been such that when it was found necessary to move the needle farther at the forward end of its oscillation it would be moved less at the rear end. By this means the point of the needle may be left projecting above the deck to interfere with the passage of the grain. The device herein described and illustrated overcomes this objection, since the needle always returns to the same position under the deck, or about so, regardless of its adjustment relative to the knotter.

Pivoted upon the needle-shaft L is the compressor-arm M, to which is secured the compressor-hook m, and pivoted in a like manner is the compressor-actuating arm M'. Interposed between said compressor-arm and the actuating-arm is the compressor-spring

m', which produces a yielding pressure upon the bundle. The position of said compressor is determined by the stop d, located in this instance upon the support D, which stop is adapted to engage the lug m^3 upon the compressor-arm M, Figs. 1 and 2. A properly-timed cam i^2 is located upon the spur-gear I^3 and is adapted to engage an antifriction-roller m^2 on the actuating-arm M'. When the bundle has been bound, the antifriction-roller m^2 is disengaged from the delay-surface i^3 of the cam i^2 and the compressor-hook dropped on its pivot to permit the discharge of the bundle, after which it is again raised to its normal position by the cam i^2.

Upon the arm of the needle L' is secured a roller or cam l^6, which is adapted to engage the operating-arm f' of the vibrating hanger F, as above referred to. During the packing of the bundle the intermediate pinion F' is held in mesh with the spur-gear G' by the spring f^2 or other suitable means; but when the needle rises in the operation of binding the roller or cam l^6 engages the operating-arm f', and thereby moves the vibrating hanger on its pivot and carries the intermediate pinion out of mesh with the spur-gear G', thus causing the packers to intermit in their operation alternately with the binding mechanism. When the bundle has been bound and the needle recedes, the vibrating hanger, through the action of the spring f^2 again carries the intermediate pinion F' into mesh with the spur-gear G', thereby actuating the packers.

It will be seen from the relative positions of the axes of the intermediate pinions F' and J' to the axes of the gears E' and G' and E' and I^3 of their respective trains and the direction of rotation of the driver E' that when once said pinions are thrown into mesh the tendency is to remain so and to be forced in more deeply. To prevent their meshing too closely together, each of the two trains is provided with pitch-line shrouds which are adapted to roll together, thus forming automatic stops.

Heretofore the gearing for driving the knotter-shaft has been outside the binder-frame. More or less trouble has been experienced by straw getting into it and being wound up. Here a binder-frame is provided with cases for inclosing said gearing. At the intersection of the horizontal members of the binder-frame A with the transverse member are the cases a^3 and a^4, which inclose, respectively, the miter-gears i and i'. The openings of said casings are closed by the coverings a^5 and a^5. In this manner the gearing is completely inclosed and protected from all foreign substances, thus making the life of the gears longer and their operation less troublesome.

The successful operation of this invention does not depend upon the use of the packer-stopping device herein shown and illustrated. The device for accomplishing this end, patented to me July 2, 1901, No. 677,553, can quite as readily be used instead in combination with the other parts described. Hence I do not wish to limit myself to the means for stopping the packers as above described.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In an automatic grain-binder, the combination with a binding mechanism and a packing mechanism, of a constantly-rotating driving-shaft, intermittently-rotating binder-shaft and packer-shaft, gears mounted upon said driving-shaft, binder-shaft and packer-shaft, intermediate gears movably mounted, means, actuated by the packing mechanism, for moving one of said intermediate gears into position to transmit rotary motion from said driving-shaft to said binder-shaft, and also means, controlled by the binding mechanism, for moving another of said intermediate gears into position to transmit rotary motion from said driving-shaft to said packer-shaft, whereby the binding mechanism and packing mechanism are caused to intermit alternately in their operation, substantially as described.

2. In an automatic grain-binder, the combination with a binding mechanism and a packing mechanism, of a continuously-rotating driving-shaft having a gear thereon, an intermittently-rotating binder-shaft having also a gear thereon, an intermediate gear in constant mesh with the gear on said driving-shaft, means, actuated by the packing mechanism, for moving said intermediate gear into mesh and means for moving it out of mesh with the gear on said binder-shaft, an intermittently-rotating packer-shaft having a gear thereon, a second intermediate gear in constant mesh with the gear on said driving-shaft, and also means, controlled by the binding mechanism, for moving said second intermediate gear into and out of mesh with the gear on said packer-shaft, whereby the binding mechanism and the packing mechanism are caused to intermit alternately in their operation, substantially as described.

3. In an automatic grain-binder, the combination with a binding mechanism and a packing mechanism of a continuously-rotating driving-shaft having a spur-gear secured thereto, an intermittently-rotating binder-shaft having also a spur-gear secured thereto, an intermediate spur-gear in constant mesh with the gear secured to said driving-shaft, a vibrating trip-arm on which the said intermediate gear is mounted, the axis of which is concentric with said driving-shaft, packers, means, actuated by said packers, for moving said trip-arm on its axis and thereby carrying said intermediate gear mounted thereon into mesh and means, actuated by the binding mechanism, for carrying it out of mesh with the gear on said binder-shaft, an intermittently-rotating packer-shaft having a spur-gear secured thereto, a second interme-

diate spur-gear in constant mesh with the gear on said driving-shaft, a vibrating hanger in which the said second intermediate gear is mounted, the axis of which is concentric with said driving-shaft, an oscillating needle, and means, controlled thereby, for moving said vibrating hanger on its axis and thereby carrying the intermediate gear mounted therein into and out of mesh with the gear on said packer-shaft, whereby the binding mechanism and the packing mechanism are caused to intermit alternately in their operations, substantially as described.

4. In an automatic grain-binder, the combination with a binding mechanism and a packing mechanism, of a constantly-rotating driving-shaft, an intermittently-rotating binder-shaft, gears mounted upon said driving-shaft and binder-shaft, an intermediate gear movably mounted, means, actuated by the packing mechanism, for moving said intermediate gear into position to transmit rotary motion from said driving-shaft to said binder-shaft, whereby intermittent rotation is imparted to the binding mechanism, substantially as described.

5. In an automatic grain-binder, the combination with a binding mechanism and a packing mechanism, of a constantly-rotating driving-shaft having a gear thereon, an intermittently-rotating binder-shaft having also a gear thereon, an intermediate gear in constant mesh with the gear on said driving-shaft, means, actuated by the packing mechanism, for moving said intermediate gear into mesh and means for moving it out of mesh with the gear on said binder-shaft, whereby intermittent rotation is imparted to the binding mechanism, substantially as described.

6. In an automatic grain-binder, the combination with a binding mechanism and a packing mechanism, of a continuously-rotating driving-shaft having a spur-gear secured thereto, an intermittently-rotating binder-shaft having also a spur-gear secured thereto, an intermediate spur-gear in constant mesh with the gear secured to said driving-shaft, a vibrating trip-arm on which the said intermediate gear is mounted, the axis of which is concentric with said driving-shaft, packers, means, actuated by said packers, for moving said trip-arm on its axis and thereby carrying said intermediate gear mounted thereon into mesh and means, actuated by the binding mechanism, for carrying it out of mesh with said gear on said binder-shaft, substantially as described.

7. In an automatic grain-binder, the combination with the binding mechanism of a constantly-rotating driving-shaft having a gear thereon, an intermittently-rotating binder-shaft having also a gear thereon, an intermediate gear in constant mesh with the gear on said driving-shaft, a vibrating trip-arm on which said intermediate gear is mounted, the axis of which is concentric with said driving-shaft, a trip-stop adapted normally to engage said trip-arm, means for holding it in engagement therewith, packers, means actuated by said packers, through the instrumentality of the accumulating intervening bundle, for disengaging said trip-stop from said trip-arm, links connecting said packers with said trip-arm adapted, through the action of said packers upon the accumulated grain, to move said trip-arm upon its axis and thereby carry said intermediate gear mounted thereon into mesh with the gear on said binder-shaft, and a mutilation on the gear on said binder-shaft adapted to engage said intermediate gear and move it out of mesh therewith, whereby intermittent rotation is imparted to the binding mechanism, substantially as described.

8. In an automatic grain-binder, the combination with the binding mechanism of a constantly-rotating driving-shaft having a spur-gear secured thereto, an intermittently-rotating binder-shaft having also a spur-gear secured thereto, an intermediate spur-gear in constant mesh with the gear secured to said driving-shaft, a vibrating trip-arm on which said intermediate gear is mounted, the axis of which is concentric with said driving-shaft, a trip-stop adapted normally to engage said trip-arm, packers, means, actuated by said packers, through the instrumentality of the accumulating intervening bundle, for disengaging said trip-stop from said trip-arm, a pivoted packer-link support, links connecting said packers with said pivoted support, a link connecting said pivoted support with said trip-arm adapted, through the action of said packers upon the accumulated grain, to move said trip-arm upon its axis and thereby carry said intermediate gear mounted thereon into mesh with the gear on said binder-shaft, and a mutilation on the gear on said binder-shaft adapted to engage said intermediate gear and move it out of mesh therewith, whereby intermittent rotation is imparted to the binding mechanism, substantially as described.

9. In an automatic grain-binder, in combination with an intermittently-rotating binder-shaft and an oscillating needle actuated thereby, means connecting said binder-shaft and needle, whereby the oscillation of said needle may be adjusted at one extremity only thereof, substantially as described.

10. In an automatic grain-binder, in combination with an intermittently-rotating binder-shaft having a crank secured thereto and an oscillating needle, a bell-crank pivoted to the needle-arm, adjustable means for holding it normally rigid therewith, and a pitman connecting the crank on said binder-shaft with said bell-crank on the needle-arm, whereby the oscillation of said needle may be adjusted at one extremity thereof, substantially as described.

11. In an automatic grain-binder, in combination with an intermittently-rotating

binder-shaft having a crank secured thereto and an oscillating needle, a bell-crank pivoted to the needle-arm, a bolt pivoted in said bell-crank provided with lock-nuts adapted to engage a lug on said needle, and a pitman connecting the crank on said binder-shaft with said bell-crank on the needle-arm, whereby said needle may be adjusted relative to the knotter without changing its relation to the deck, substantially as described.

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

JOHN F. APPLEBY.

Witnesses:

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A. B. HANSON.