(No Model.) 3 Sheets—Sheet 1.

R. E. DORTON.

BAND CUTTER AND FEEDER.

No. 506,422. Patented Oct. 10, 1893.

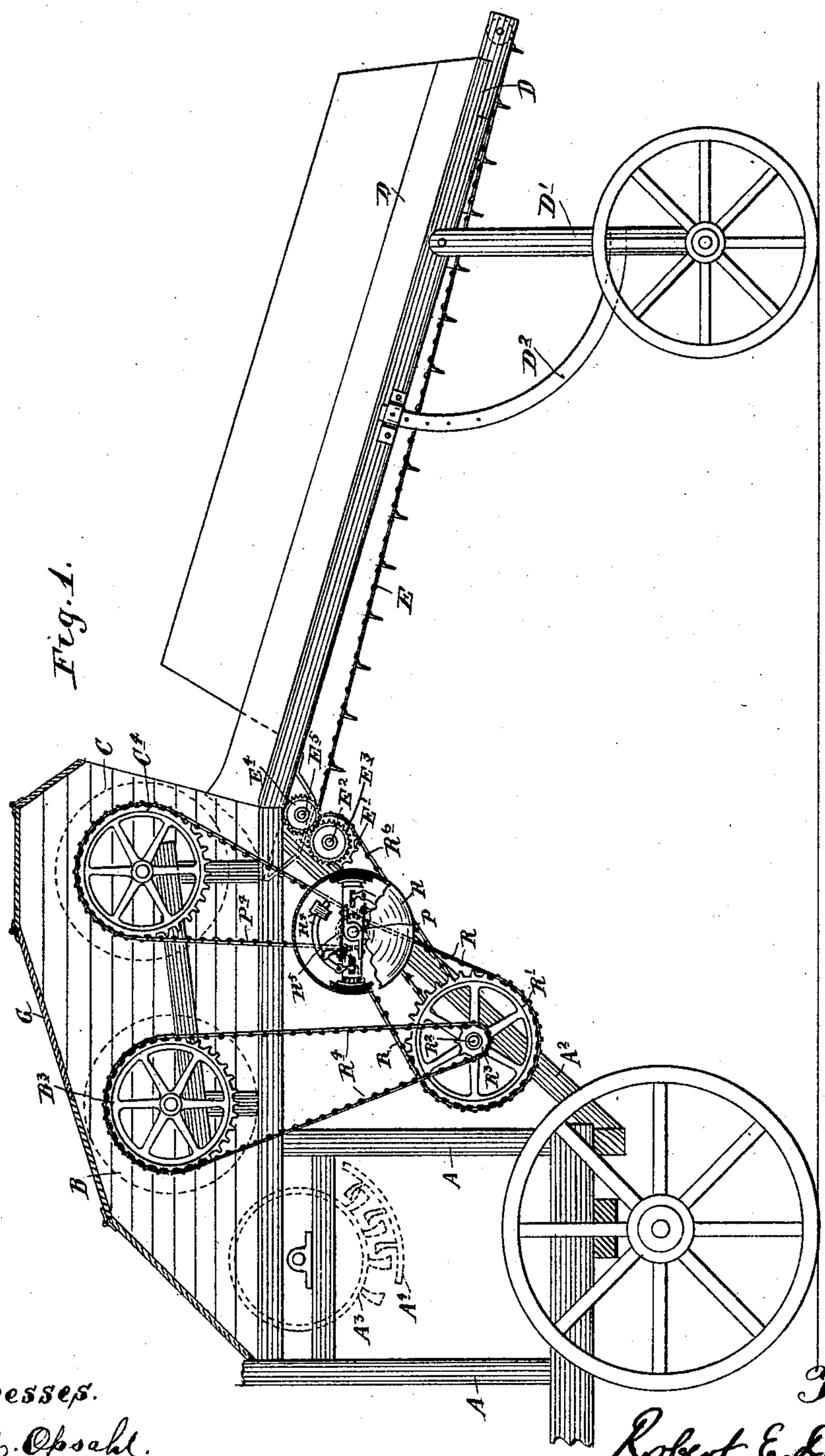

Fig. 1.

Witnesses.
A. H. Opsahl.
Emma F. Elmore.

Inventor.
Robert E. Dorton
By his Attorney.
Jas. F. Williamson

(No Model.) 3 Sheets—Sheet 2.

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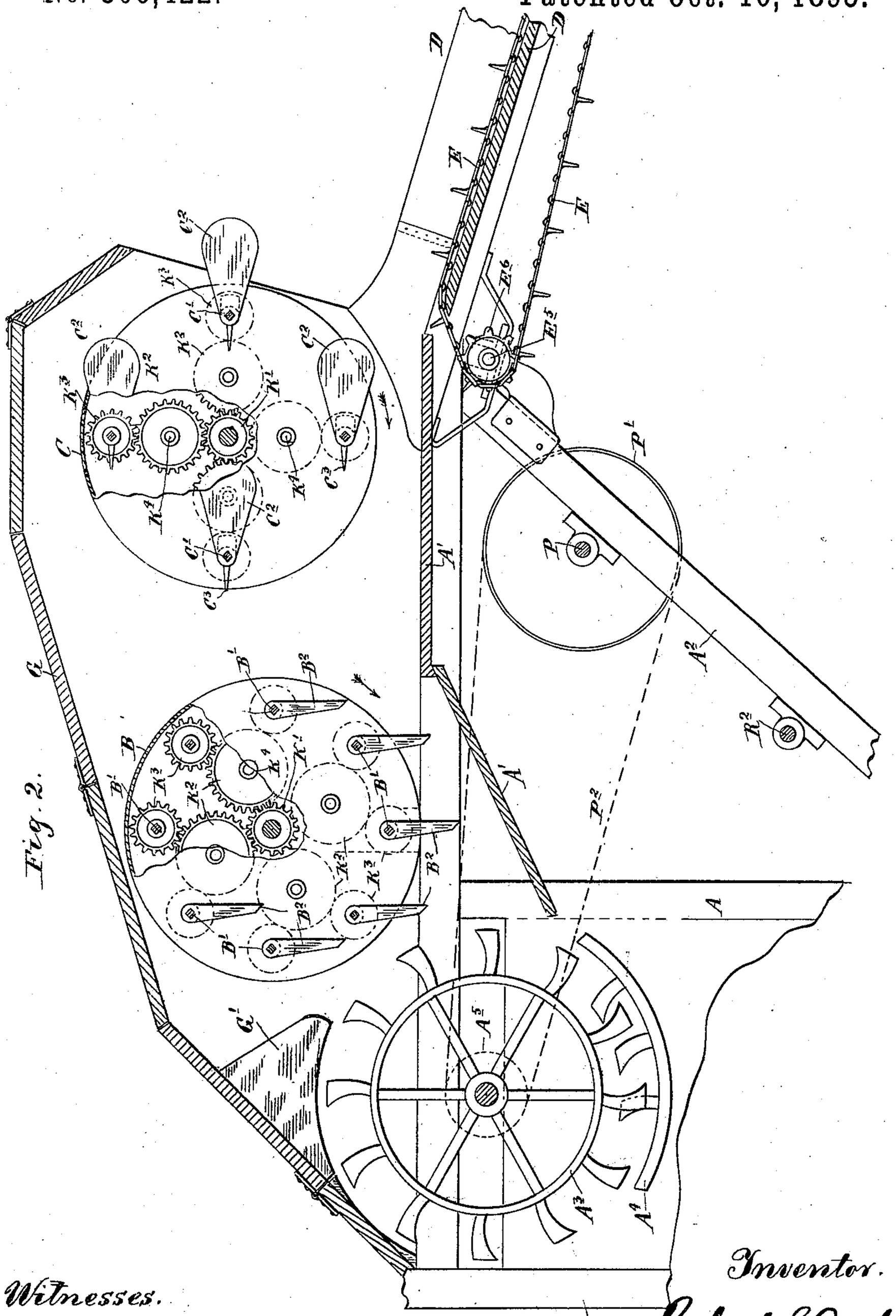

Fig. 2.

Witnesses.
Emma F. Elmore
A. W. Opsahl.

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(No Model.) 3 Sheets—Sheet 3.

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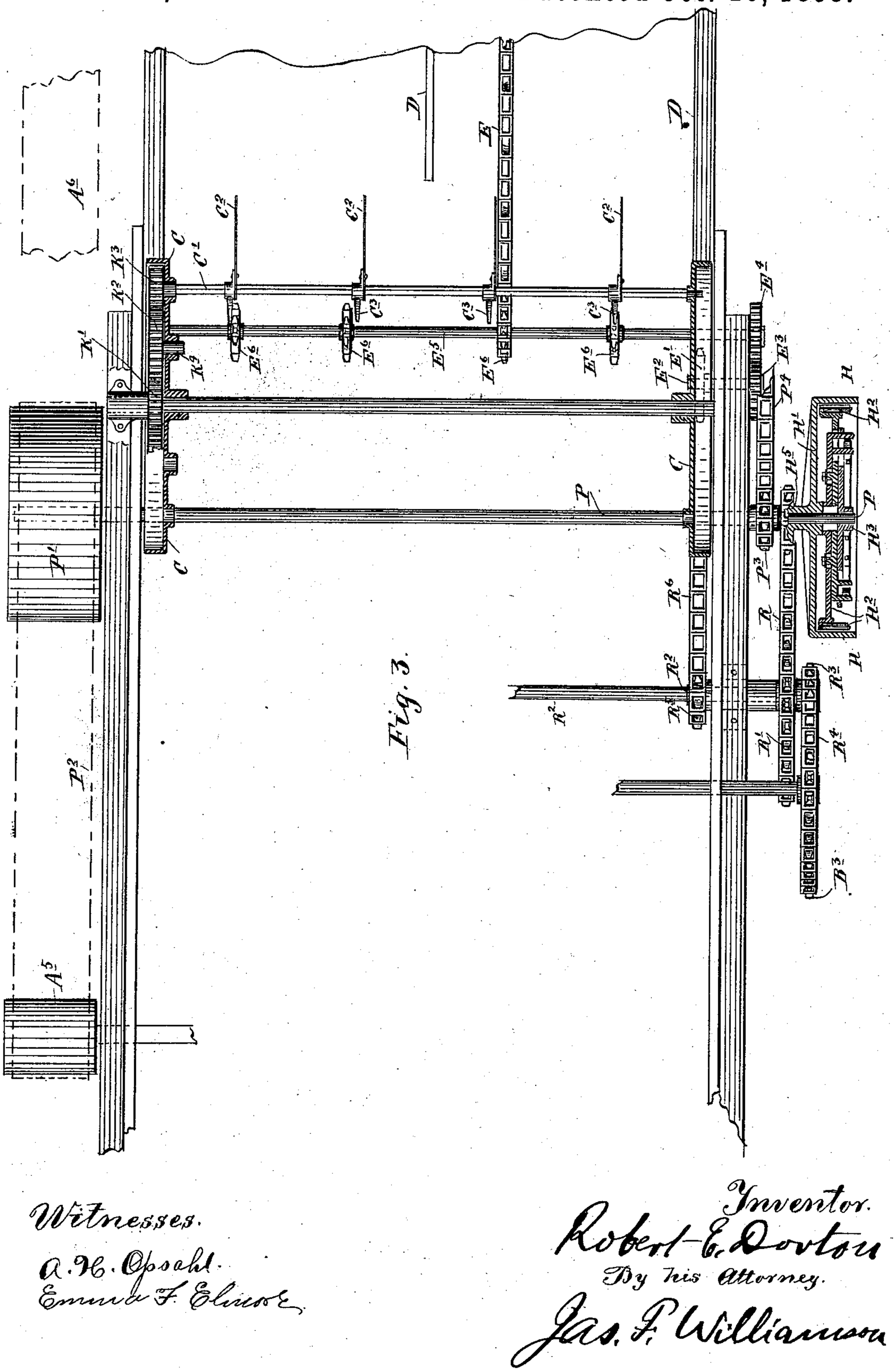

Fig. 3.

Witnesses.
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Emmet F. Elwood.

Inventor.
Robert E. Dorton
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UNITED STATES PATENT OFFICE.

ROBERT E. DORTON, OF MINNEAPOLIS, MINNESOTA.

BAND-CUTTER AND FEEDER.

SPECIFICATION forming part of Letters Patent No. 506,422, dated October 10, 1893.

Application filed March 1, 1892. Serial No. 423,338. (No model.)

To all whom it may concern:

Be it known that I, ROBERT E. DORTON, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Band-Cutters and Feeders;) and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention has for its object to provide an efficient band cutter and feeder for thrashing machines. To this end, I employ a feeding device arranged parallel with and delivering to the thrashing cylinder; a clearing device working against the back pressure from the feeding device to clear the same from any excess of stock accumulating between the said feeding and clearing device, so as to prevent any excess of stock being fed forward; a rotary band-cutter having feathering blades; a resisting surface for the band-cutter and the feeding device; a bundle table extending forward of the feed board provided with endless conveyers delivering to the band cutter; a hood over-decking the feeding device and the band cutting and clearing devices open at its forward end and co-operating with the said devices to redeliver the excess of stock thrown back by the clearing device onto the conveyers; and a friction clutch governor controlled by the velocity of the thrashing cylinder and having driving connections with the bundle conveyers and the feeding device, whereby the feed of the stock will be checked or stopped whenever the thrashing cylinder falls below the speed required for the proper thrashing action. The feeding device is preferably in the form of a rotary cylinder and the clearing devices and the band cutting knives are preferably carried by one and the same cylinder, arranged in advance of and parallel with the feed-cylinder.

Other novel features in the construction and arrangement of the parts will appear in the detailed description and be particularly defined in the claims.

A machine embodying the preferred form of my mechanism is illustrated in the accompanying drawings. Therein like letters refer to like parts throughout the several views.

Figure 1 is a left side elevation of the machine, positions being taken with reference to an observer facing the travel of the stock, some parts being broken away. Fig. 2 is a vertical longitudinal section of the same, some parts being broken away; and Fig. 3 is a plan view, some parts being removed and other parts broken away.

A represents a part of the main frame of the separator.

A′ is the forwardly extended feed-board, which in this machine constitutes the resistance surface for the feed cylinder and the combined band cutting and clearing cylinder.

A ^{2} is the forwardly extended brace from the separator frame, for supporting the outer end of the feed-board and some of the operative parts.

A^3 and A^4 are respectively the thrashing cylinder and concave.

A^5 is the driving pulley on the right end of the shaft of the thrashing cylinder.

B is the rotary cylinder constituting the feed-device.

C is the combined band cutting and clearing cylinder.

D is the bundle-table, extending forward of and in line with the feed-board, and pivotally connected to the separator frame, at the head of the feed-board and supported at its outer end by a pivoted truck and lock segment D′ and D^2, to permit the angular adjustment of the same in the vertical plane.

E are the conveyers, preferably in the form of independent toothed chains delivering to the feed-board and band-cutter.

G is the hood over-decking the feeding, band-cutting and clearing devices, open at its forward end.

H is the friction clutch governor.

The feed cylinder is provided with a series of feathering shafts B′, which have rigidly secured thereto a series of spike-like teeth B^2, which are so set that they will always stand, under their feathering action, at an angle to the feed or travel of the stock. As shown, they stand approximately in vertical positions. The important point to be noted therewith is that these teeth B^2, should stand at such an angle with reference to the feed of the stock that they will only engage and carry forward the proper amount of the same

for the desired feed; and that they will clear any excess of the stock accumulating under the back pressure from the feed cylinder B.

The combined band cutting and clearing cylinder C is provided with a series of feathering shafts C′ having rigidly secured thereto a series of backwardly extended knives C^2 for cutting the bands; and a series of forwardly extended spike-like teeth C^3, for engaging with the excess of the stock accumulating under the back pressure from the feed-cylinder B. The band cutting knives C^2 and the clearing teeth C^3 normally stand, in this machine approximately parallel with the travel of the stock. The important point to be noticed in this connection, is that the knives should always extend backward with reference to the travel of the stock, so as to readily clear the same after completing their cutting action; and that the clearing teeth C^3 should always stand in such position that they will not interfere with the normal flow of the stock, but will engage with all excess of the same which may accumulate under the back pressure from the feed cylinder B. It will thus be seen that the teeth B^2 of the feed-cylinder and the clearing teeth C^3 on the combined band cutting and clearing cylinder have an important relation and co-operation with each other, the effect of which is to produce a substantially uniform feed of the stock. The over-decking hood G has its forward section set at an angle extending downward and forward, so that the co-operation of the clearing teeth C^3 and the said hood will be to carry the excess of stock backward over the combined band-cutting and clearing-cylinder C and deliver the same onto the bundle-table D and the conveyers E. The hood G is preferably made up of fixed sections and pivoted sections, the pivoted sections serving to give ready access to the working parts and to permit a yielding action to the hood at certain points where required. The particular pivoted section of the hood located between the thrashing cylinder and the feed cylinder is provided with a filling block G′, which serves to prevent an excessive back draft and outward movement of the dust from the thrashing cylinder.

Any suitable mechanism may be employed to effect the feathering action of the shafts B′ and C′. Many forms of mechanism capable of this function are old and well-known in the arts, especially as applied for feathering the paddles of paddle-wheel boats. I have used and show for the purpose, "epicyclic trains" of gears. Of these trains, the inner end member K′ is loosely mounted on the cylinder shaft and is keyed to the right bearing-box of the said shaft, so as to be held rigidly with the said bearing box. The outer end member K^3 of the said train, is keyed to the feathering shaft, and the intermediate member K^2 is mounted on a stud-shaft K^4, fixed to the head of the cylinder. The outer and inner members of the said train must be of the same size. The intermediate member may be of any size. The members of this train move in the directions indicated by the arrows; and the effect of the same is to hold the feathering shafts in constant positions in respect to the movement of the cylinder. The central member of the train is common to all the trains of gear carried by each cylinder.

The friction clutch governor is, in the detail of its construction, identical with the so-called, "automatic speed controlled clutch," shown and described in my former Patent No. 439,490, issued to me of date October 28, 1890, entitled band-cutter and feeder. A detailed description of the construction of this governor is not deemed necessary for the purposes of this case. It will probably be sufficient to state that it comprises a hollow pulley H′, loosely mounted on the shaft P, which is the main driving-shaft for the band-cutting and feeding mechanism; and a pair of radially moving friction shoes H^2, mounted for radial movement on a head-bar H^3 keyed to the shaft; and spring-held pivoted weights H^4 arranged to effect the radial motion of the friction shoes under the movement of the said shaft and head-bar. Whenever the centrifugal force overcomes the tension of the springs, the shoes will be brought into frictional engagement with the rim of the pulley and cause the same to move with the shaft. The power-shaft P carries at its right-hand end a driving pulley P′ connected by belt P^2 with the pulley A^5 of the thrashing cylinder. The power from the engine (not shown) is applied to the pulley A^5 of the thrashing cylinder by the main driving belt A^6 (only partially shown). This main belt A^6 works over the top of the belt P^2, before described. In other words, the main belt simply encircles the belt P^2, and works over the same pulley A^5. The hub of the governor pulley H′ is provided with a small sprocket H^5, connected by a sprocket chain R with a sprocket-wheel R′ on a counter-shaft R^2 supported in bearings on the front braces A^2 of the separator frame. The counter-shaft R^2 carries on its outer end a small sprocket R^3 connected by sprocket-chain R^4 with a sprocket B^3 on the left end of the shaft of the feed-cylinder. The counter-shaft R^2 also carries a sprocket R^5 connected by chain R^6 with a sprocket E′ on a shaft E^2 which is provided with a gear E^3 meshing with the gear E^4 on the conveyer-driving-shaft E^5. The power shaft P has rigidly secured thereto a sprocket P^3 connected by chain P^4 with a sprocket C^4 on the left end of the combined band-cutting and clearing cylinder shaft. The conveyer shaft E^5 has sprockets E^6 engaging the toothed conveyer chains E. It is evident that, with this arrangement of the driving-gear, the band-cutting and clearing cylinder C will be kept in constant motion; and that the feed cylinder B and the conveyers E will move whenever the governor pulley moves. The thrashing cylinder is run at the customary high rate of speed, preferably about twelve to fourteen hundred revolutions

per minute. The feed cylinder is driven at a slow speed, preferably from twenty to thirty revolutions per minute. The combined band-cutting and clearing cylinder is driven at a high rate of speed relatively to the feed cylinder, preferably from two hundred and fifty to three hundred revolutions per minute. The toothed conveyers E travel at the rate of about fifty to eighty feet per minute. The feed cylinder B is so located with reference to the thrashing cylinder that the reach between the two on the line of the feed is less than the length of the grain stalks. Hence, the butts of a bundle or bunch of stock will be held by the teeth of the feed cylinder, while the forward ends of the same will be engaged by the thrashing cylinder; and owing to the fact that the feed cylinder moves at such a slow rate of speed and that the thrashing cylinder moves at such a high rate of speed, the feed cylinder has a retarding effect on the stock relatively to the movement of the thrashing cylinder and the latter has a drawing and stripping effect on the stock while restrained or retarded by the feed cylinder.

The general operation of the machine is obvious from the description already given; but may be briefly summarized as follows:—The uncut bundles are thrown endwise on the bundle-table D, preferably heads forward, and are fed forward by the conveyers E to the cylinder C. Under the action of the knives on this cylinder, the bands will be cut and the bundles spread out and opened up and the stock be fed forward to the feed-cylinder. Under the combined effect of the two cylinders C and B, the proper amount of the stock will be fed forward and delivered to the thrashing cylinder, and any excess of stock accumulating between the two cylinders will be thrown backward by the clearing teeth C^3, through the open end of the hood G onto the conveyers E to be again presented thereby to the band-cutting cylinder. This clearing action is vital to the success of a band cutter and feeder. Otherwise, an over-feed would be effected and stock would accumulate between the two cylinders under such great pressure as to choke down the feed-cylinder and produce breakage. The control of the governor also comes in, in this connection, to insure the proper action of the operative parts. If owing to the condition of the stock, as for example, when damp, matted, or otherwise difficult to thrash, the speed of the thrashing cylinder should fall below the proper movement, to effect good work, the governor pulley H′ will be released from the friction shoes H^2, permitting the feed cylinder B and the conveyers E to stop, until the thrashing cylinder recovers its proper speed. Meantime, and at all times, the band cutting and clearing cylinder C is in continuous and rapid motion, the effect of which is either to forward the stock or clear the feed cylinder and throats of any accumulations of the same over and above the normal feed. This leaves the feed cylinder always in condition for action, when the thrashing cylinder is moving at the proper speed. The fact that the governor is a friction governor is also important to the success of the action, as it permits a yielding action between its clutch members or frictional surfaces. This permits the pulley H′ of the governor and the feed-cylinder and conveyers driven thereby to start gradually or with a yielding action, if necessary. It also permits the feed cylinder and conveyers to slow up or stop under some conditions, even if the thrashing cylinder is running at full speed. This is desirable to avoid breakage on the entrance of solid materials, or the disarrangement of the conveyers or other parts. Interference with the proper action, whether by the way of the presence of choking materials, or disarrangement of any of the parts, will be instantly revealed and breakage and danger of accidents be avoided.

In addition to the functions of the band cutting cylinder C, herein before specified, it should also be noted that the construction is such that it adapts itself to the proper draw on the uncut bundles. In other words, in case the bundles should overlie each other and pile up, at the delivery end of the bundle conveyers E, the feathering action of the knives C^2 will simply throw the top bundles outward and will not begin to have any draw on the uncut bundles, until approaching near to the conveyers. It is therefore impossible to choke the band-cutter. If several bundles overlie each other, stacking up against the hood, for example, the upper bundles will simply stand there, as demonstrated by actual work, until the lower bundles are drawn in.

By actual usage, I have demonstrated that this machine will do good work and that it has large capacity.

It will of course be understood, that modifications might be made in many of the details of the construction, and in the arrangement of some of the parts. For example, the clearing teeth C^3 and the band cutting knives C^2 might be carried on independent cylinders, spaced apart from each other, with the latter in front of the former.

Having regard to the broad feature of co-operating feed-device delivering directly to the thrashing mechanism and a clearing device working in connection therewith, to prevent an excess of feed, I desire to have it understood that I do not limit myself to the particular form of feed device and the particular form of clearing device herein shown and described. Both devices might be otherwise constructed. The devices herein shown and described, are, however, the best possible constructions for the purpose.

The feed-cylinder B herein shown and described as located parallel with the thrashing cylinder and with a reach between the two of less extent that the grain-stalks or bundles of grain to be thrashed, is similarly shown and described and claimed in my

pending application Serial No. 423,337, filed of date March 1, 1892, entitled method of and apparatus for feeding stock to thrashing machines.

What I claim, and desire to secure by Letters Patent of the United States, is as follows:

1. In a thrashing machine the combination with band cutting and feeding devices and a thrashing cylinder, of mechanism constructed and operating to remove any excess of stock which may accumulate between the band cutting devices and the thrashing cylinder and deposit the same in front of the band cutting mechanism, substantially as described.

2. In a thrashing machine, the combination with the thrashing cylinder, of a rotary cylinder provided with feathering shafts and clearing teeth carried on and feathered by said shafts, adapted to throw outward to the front of the machine any excess of stock which may accumulate between the band-cutting mechanism and the thrashing cylinder.

3. In a thrashing machine, the combination with the thrashing cylinder, of a rotary cylinder provided with feathering shafts, carrying band cutting knives and clearing teeth, the said cylinder operating to cut the bundles spread and forward the stock, and to throw outward to the front any excess of stock which may accumulate between the said band cutting and clearing cylinder and the said thrashing cylinder, substantially as described.

4. A feeding mechanism for thrashers, comprising a feed cylinder for effecting a forced feed to the thrasher and a clearing cylinder for preventing an excessive feed by said feed cylinder, the said clearing cylinder being arranged to work against the back pressure of the feed cylinder to throw backward and clear the same of any excess of stock accumulating between the said cylinders.

5. A feeding mechanism for thrashers, comprising a feed cylinder and a clearing cylinder having forwardly projecting teeth, for preventing an excessive feed by said feed cylinder, the said clearing cylinder being arranged to work against the back pressure of the feed cylinder to throw backward and clear the same of any excess of stock accumulating between the two cylinders.

6. A feeding mechanism for thrashers comprising a toothed feed cylinder and a toothed clearing cylinder, the latter of which works against the back pressure of the former, the teeth of the feed cylinder being arranged to engage stock to effect a normal feed and clear the accumulated excess of stock and the teeth on the clearing cylinder being arranged to clear the normal feed of stock and to engage and return the excess of stock accumulating between the two cylinders, substantially as described.

7. In a thrashing machine, a band cutter consisting of a rotary cylinder, provided with feathering shafts carrying the band cutting knives, substantially as described.

8. In a thrasher, the combination with a resisting surface of one or more conveyers for supplying the uncut bundles and a rotary band cutter, arranged transversely to said conveyers and resisting surface and provided with feathering knives feathering opposite to the movement of the stock, substantially as and for the purpose set forth.

9. A band cutting and feeding mechanism for thrashers, comprising a feed cylinder parallel with and delivering to the thrashing cylinder and a combined band cutting and clearing cylinder provided with a series of backwardly extended feathering knives and forwardly extended feathering teeth, the said combined cutting and clearing cylinder being arranged in advance of and parallel with the feed cylinder, the feathering knives of the same serving to cut the bands, spread out the bundles and supply the stock to the feed cylinder and the said feathering teeth working against the back pressure from the feed cylinder and serving to catch and throw backward any excess of stock which would otherwise be carried forward by the feed cylinder, substantially as described.

10. The feeding mechanism for thrashers, comprising the feed cylinder with feathering teeth standing at an angle to the movement of the stock and the combined band cutting and clearing cylinder provided with feathering knives and feathering teeth standing approximately parallel with the line of the feed, substantially as and for the purpose set forth.

11. A band cutter and feeder comprising a forwardly extended feed table, a bundle table extending forward of the feed-table and provided with conveyers delivering thereto a feed cylinder parallel with and delivering to the thrashing cylinder, a combined band cutting and clearing cylinder overhanging the feed table in advance of and parallel with the feed cylinder and provided with feathering shafts having secured thereto backwardly extended knives and forwardly extended clearing teeth and an open ended hood over-decking the said cylinders and provided with a deflecting board for cooperation with said clearing teeth to redeliver to the conveyers the excess of stock thrown back thereby, substantially as described.

12. In a thrasher, the combination with the thrashing cylinder, of the feed cylinder, the combined band cutting and clearing cylinder, the endless conveyers for supplying the bundles, the friction clutch governor, driving connections arranged to keep the combined band cutting and clearing cylinder in continuous motion, and driving connections from the thrashing cylinder to the said feed cylinder and the said conveyers having said friction clutch governor as one element thereof, substantially as and for the purposes set forth.

13. In a thrasher, the combination with the thrashing cylinder and a feeding device delivering directly thereto, of the combined band

cutting and clearing cylinder, the endless conveyers for supplying the bundles, the friction clutch governor, driving connections, arranged to keep the said band cutting and clearing cylinder in continuous motion, and driving connections from the thrashing cylinder to the said feed device and to the said conveyers, having said friction clutch governor as one element thereof, substantially as and for the purpose set forth.

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

ROBERT E. DORTON.

Witnesses:
JAS. F. WILLIAMSON,
EMMA F. ELMORE.