No. 635,464. Patented Oct. 24, 1899.

# O. E. BRAY.

## ENSILAGE CUTTER.

(Application filed Feb. 14, 1898.)

(No Model.) 3 Sheets—Sheet 1.

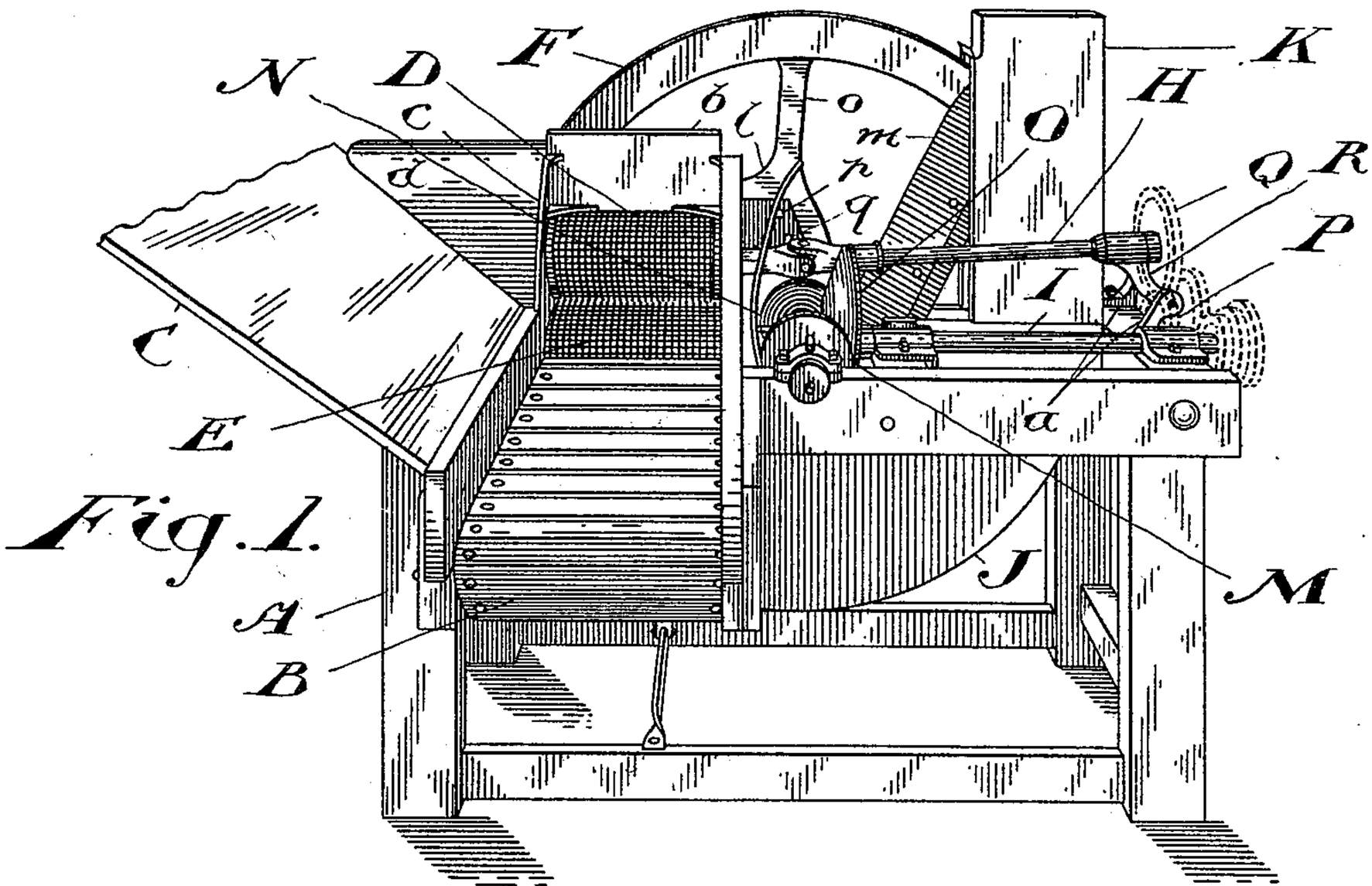


Fig. 1.

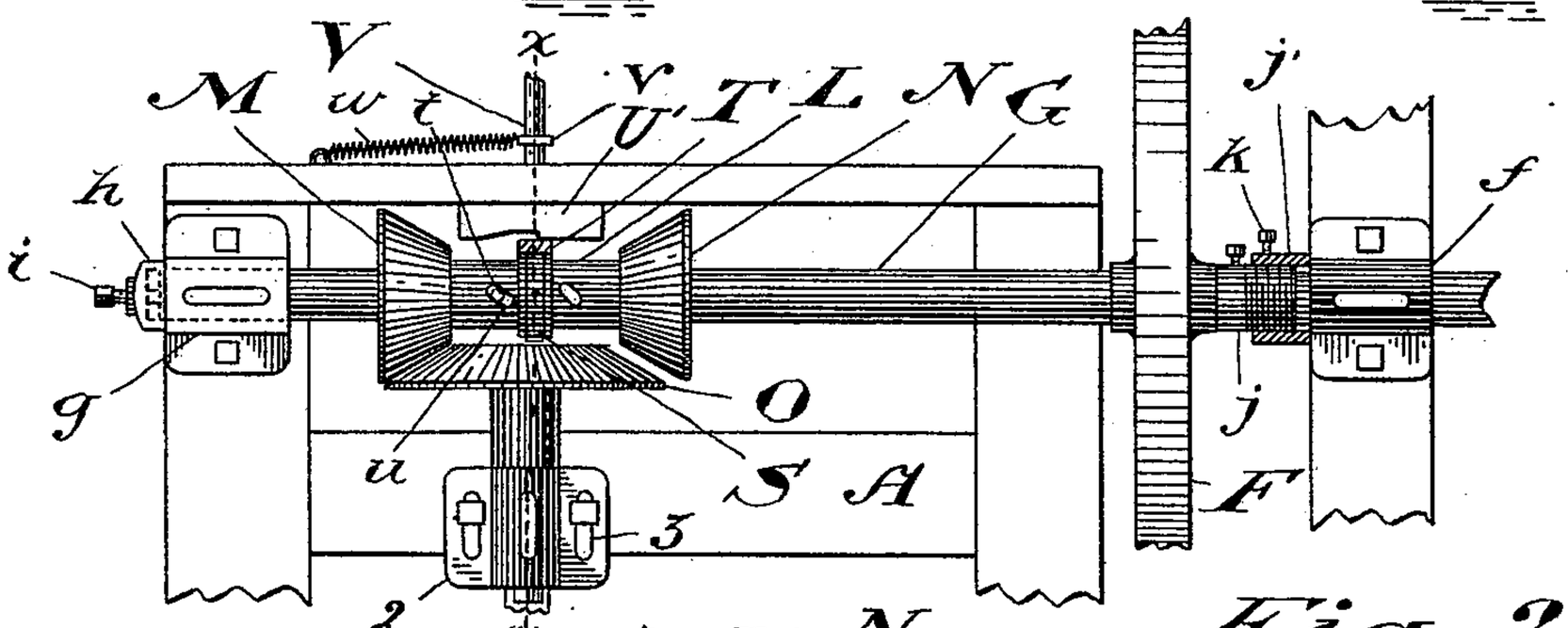


Fig. 2.

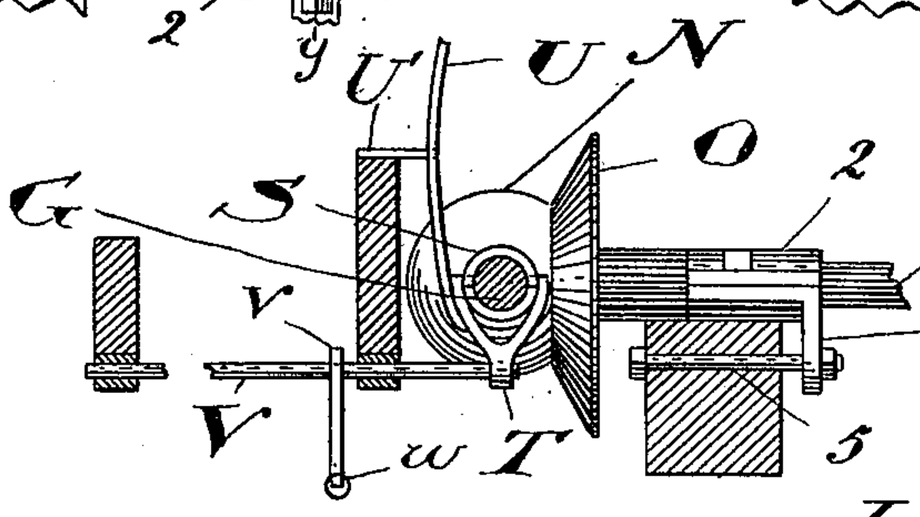


Fig. 3.

Witnesses

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## ENSILAGE CUTTER.

(Application filed Feb. 14, 1898.)

(No Model.) 3 Sheets—Sheet 2.

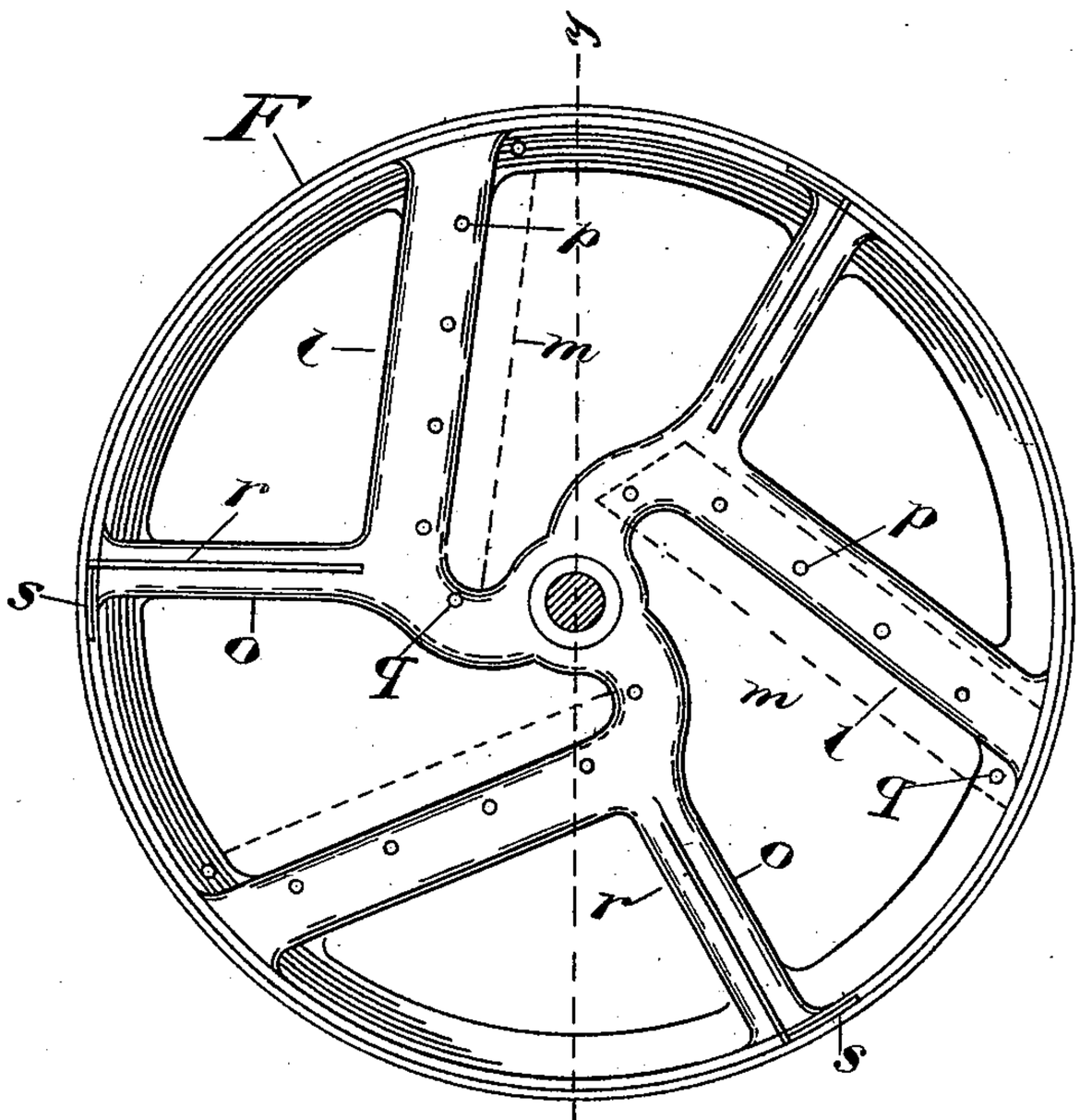


Fig. 4.

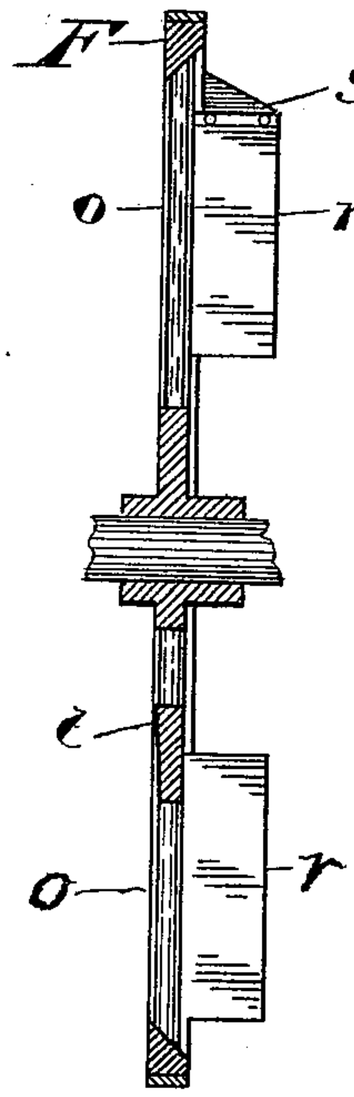


Fig. 5.

Witnesses

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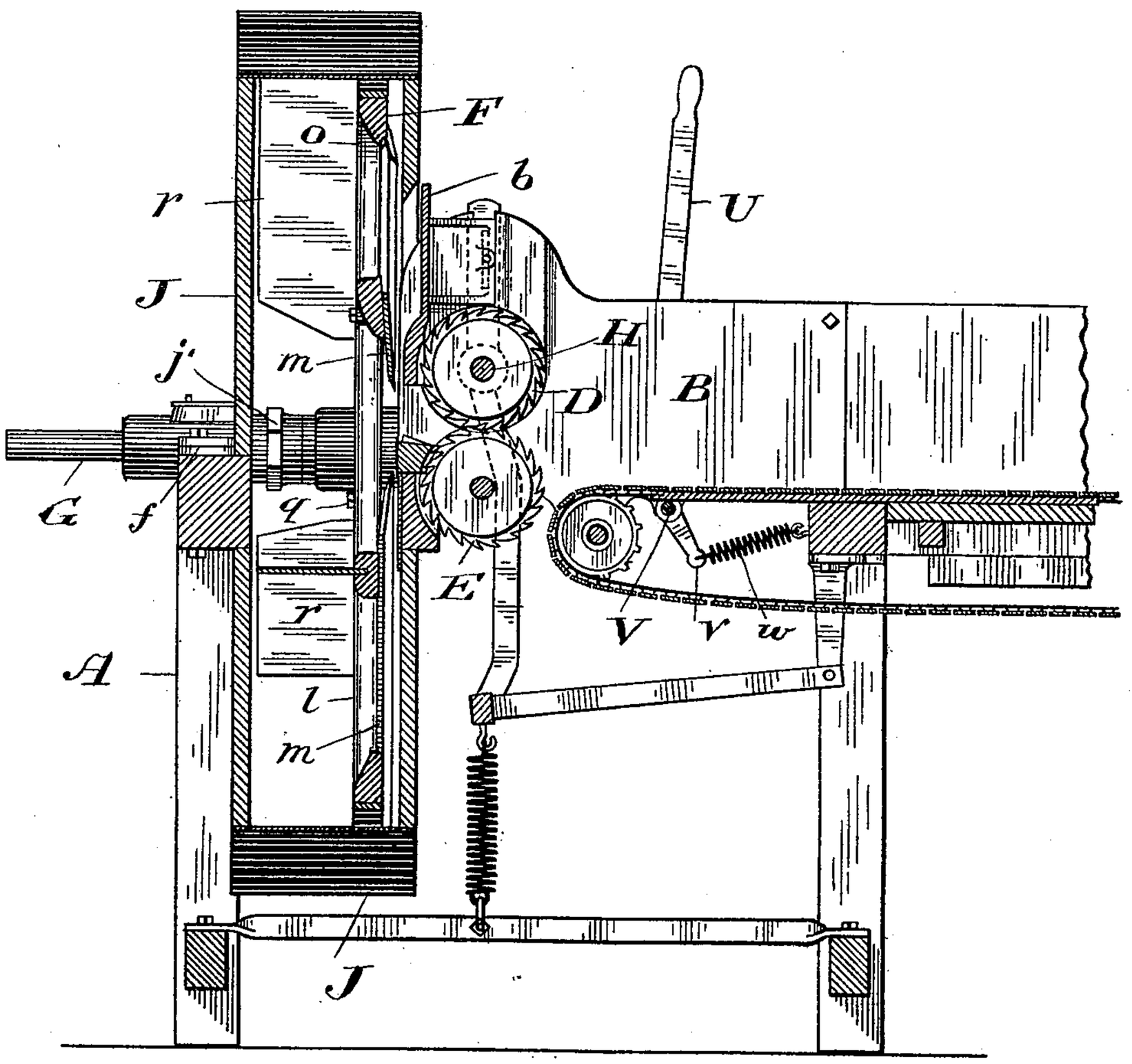
## ENSILAGE CUTTER.

(Application filed Feb. 14, 1898.)

(No Model.) 3 Sheets—Sheet 3.

*Fig. 6.*




Witnesses

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H. H. G. Ardagh.

Inventor

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# UNITED STATES PATENT OFFICE.

OSCAR E. BRAY, OF TORONTO, CANADA, ASSIGNOR OF ONE-HALF TO EDWARD G. E. FFOLKES, OF SAME PLACE.

## ENSILAGE-CUTTER.

SPECIFICATION forming part of Letters Patent No. 635,464, dated October 24, 1899.

Application filed February 14, 1898. Serial No. 670,197. (No model.)

*To all whom it may concern:*

Be it known that I, OSCAR EZRA BRAY, of the city of Toronto, in the county of York and Province of Ontario, Canada, have invented certain new and useful Improvements in Ensilage-Cutters, of which the following is a specification.

My invention relates to certain improvements in an ensilage-cutter patented to me in Canada under No. 52,093 on the 24th of April, 1896, which has for its objects, first, to improve the frictional driving-gear so as to obviate heating; second, to so support the driving-shaft of the upper feed-roller as to prevent its driving gear-wheel from being drawn out of alinement with the gear-wheel of the lower roller when the upper roller is raised or depressed; third, to so construct the feed-box and feed-board that the uncut feed will slide properly into position to be fed to the knives without jamming or sticking; fourth, to adjustably support the knife-wheel so as to avoid the necessity of separately adjusting the knives, and, fifth, to construct the knife-wheel and support the knives in as efficient and economical a manner as possible.

With these objects in view my invention consists, essentially, first, in the use of bevel gear-wheels in the frictional drive and in securing the reversal of the motion by moving the driving bevel-wheels instead of the driven; second, in journaling the bearing at the outer end of the upper-feed-roll shaft on or about the lower side of the wheel instead of on a level with the shaft; third, in cutting down the outer side of the feed-box below the level of the upper edge of the inner side in filling in the angle between the feed-board and the feed-roll frame with a curved triangular guide-piece, as shown, and in throwing forward the guard-plate above the upper feed-roll close to the knife-wheel, so as to prevent the passage of air in front of it down through the knives and into the fan-casing; fourth, in making the knife-wheel shaft longitudinally adjustable in its bearings, so that the knives will be simultaneously set instead of requiring separate adjustment by means of set-screws or other devices; fifth, in setting the knife-arms of the fly-wheel at such an angle that the outer edge of the knife completes its cut some time before the heel of the knife comes into action, and in such other details of construction as are hereinafter more specifically described and then definitely claimed.

Figure 1 is a perspective view of my machine from the rear with the upper part of the fan-casing removed. Fig. 2 is a plan view showing the frictional driving-gear and the adjustment for the knife-wheel shaft. Fig. 3 is a sectional elevation through $x\ y$ in Fig. 2. Fig. 4 is a front elevation of the knife-wheel. Fig. 5 is a vertical section of the same. Fig. 6 is a vertical longitudinal section of the machine through the feed-box.

In the drawings like letters and numerals of reference indicate corresponding parts in the different figures.

My machine is constructed in general on the lines indicated in the previous Canadian patent referred to and only such parts will be particularly described as show novelty of construction.

A is the main frame of the machine; B, the feed-box; C, the feed-board; D and E, the feed-rolls; F, the knife-wheel; G, the knife-wheel shaft; H, the upper-feed-roll shaft; I, the counter-shaft; J, the fan-casing, and K the discharge-spout.

Upon the knife-wheel shaft G, I place a sleeve L, carrying the opposite friction bevel and gear wheels M and N, which may be slid upon the shaft, so that either one will engage with the friction bevel gear-wheel O on the counter-shaft I. As in my previous machine, this counter-shaft drives the lower feed-shaft (not shown) by means of the sprocket-wheels and the sprocket-chain. (Shown at the right hand in Fig. 1.) The lower-feed-roll shaft by means of the bevel gear-wheel P (partly shown in dotted lines) drives the gear-wheel Q upon the upper-feed-roll shaft H. The outer end of this shaft is carried in the bearing R, which has arms depending thereon which are journaled in the lugs *a* upon the frame of the machine. The bearings in these lugs are so located as to be substantially on a level with the lower edge of the gear-wheel Q, so that the rocking motion of the upper-feed-roll shaft when in motion will not cause the teeth of its gear-wheel to draw backward

and forward across the teeth of the gear-wheel upon the lower-feed-roll shaft.

The shaft H is connected by the usual universal joint with the upper feed-roll D.

My present invention has nothing to do with the means employed for supporting the upper feed-roll so as to enable it to rise and fall; but I have made an improvement by setting forward the guard-plate *b*, so as to bring it close to the fan-casing and knife-wheel, thus obviating the possibility of air passing in front of it through the knife-wheel and into the fan, which would spoil the efficiency of its work.

Between the feed-roll frame *c* and the feed-board C, I insert the triangular-curved guide-plate *d*, so as to suitably direct the feed to be cut into the feed-box B. The outer side of this feed-box is made quite low, as shown, so as to facilitate the delivery of the feed into the feed-box.

The knife-wheel shaft G is supported in the bearings *f* and *g*. The bearing *g* at the rear of the frame is of ordinary construction, but is provided with an end cap *h*, through which passes a set-screw *i*, which bears against the end of the shaft G. Upon the shaft G near its other end is secured a sleeve *j*, with a sleeve *j'* screwed thereon which butts against the inner end of the bearing *f*, and thus serves to limit the motion of the shaft toward the front, while the set-screw *i* limits it toward the rear. By suitably adjusting the sleeve and set-screw the knives may be accurately set without requiring separate adjustment. The sleeve *j'* is preferably provided with a set-screw *k*, by which it may be securely held after adjustment.

The knife-wheel F (see Figs. 4 and 5) is provided with the knife-spokes *l*, set substantially at the angle shown, so that the outer end of the knife *m*, connected thereto, will finish its cut some time before the heel.

*o* are the fan-spokes, preferably extending outwardly from the point at which the knife-spokes turn inward to the hub.

The knives *m* are straight, and therefore easily made, and are connected to the knife-spokes by the bolts *p* along their backs and the bolts *q* at each end close to their cutting edges. By thus holding the knives they are so rigidly held in position that all possibility of breaking is avoided.

*r* are the fan-blades, formed of steel plates cast with their edges within the spokes. The brackets *s*, connected to the backs of the fan-blades, are at the same time cast within the iron of the rim.

As will be seen in Fig. 5, the rim of the wheel is beveled, so as to prevent the lodgment of cut feed thereon.

It will be necessary to describe the means used for moving the friction bevel-wheels M and N. A pin *t* projects from the shaft G into a diagonal slot *u* in the sleeve L, which slot is so shaped that the pressure of the rim in driving tends to draw the bevel gear-wheel M into contact with the bevel-wheel O. A ring S is set in a groove in the sleeve G in the manner usual in clutch-shifting devices. This ring S is connected with a forked arm T, fast on the shaft V, suitably journaled in the frame of the machine. U is a lever connected to this shaft V, so that by rocking the lever the sleeve L may be moved to throw either of the friction bevel-wheels M or N into contact with the friction bevel-wheel O. In order to maintain the bevel-wheel N normally in contact with the bevel-wheel O, I extend an arm *v* downward from the shaft V and connect one end of a coil-spring *w* to it and its other end to some part of the frame, so that the tension of the spring assists the pin *t* and slot *u* in producing the effect desired. When it is desired to reverse the motion of the feed-rolls to clear them when choked, it is only necessary to move forward the lever U, when the friction bevel-wheels M and N are brought into contact and the motion of the feed is reversed.

U' is a notched plate with which the lever may be engaged to hold both of the bevel-wheels M and N out of contact with the bevel-wheel O.

To permit of the adjustment of the friction bevel-wheel O to take up wear, I make the bearing 2 adjustable upon the frame by means of bolts working in slots 3. A portion of the bearing 4 also depends from its end and has a bolt 5 passing through it adapted to draw it toward a portion of the frame to regulate the adjustment of the bearing.

What I claim as my invention is—

1. In an ensilage-cutter, the knife-wheel shaft, a sleeve movable thereon and provided with a diagonal slot; a pin projecting from the shaft through the said slot, and two friction bevel-wheels fast upon the said sleeve, in combination with a counter-shaft adapted to drive the feed-rolls; and a friction bevel-wheel fast thereon, in proximity to the aforesaid friction bevel-wheels so that the above-mentioned pin and slot tend to maintain one of them in contact with the friction bevel-wheel upon the counter-shaft, the said slot running in the direction in which the sleeve has been moved for the purpose of engaging the aforesaid bevel-wheel, but slanting toward the direction from which the main shaft is turning, substantially as and for the purpose specified.

2. In an ensilage-cutter, the knife-wheel shaft, a sleeve movable thereon and provided with a diagonal slot; a pin projecting from the shaft through the said slot and two friction bevel-wheels fast upon the said sleeve, in combination with a counter-shaft adapted to drive the feed-rolls; and a friction bevel-wheel fast thereon, in proximity to the aforesaid friction bevel-wheels so that the above-mentioned pin and slot tend to maintain one of them in contact with the friction bevel-wheel upon the counter-shaft, the said slot running in the direction in which the sleeve

has been moved for the purpose of engaging the aforesaid bevel-wheel, but slanting toward the direction from which the main shaft is turning, and clutch-shifting mechanism connected with the sleeve by means of which either or neither of the knife-shaft friction-wheels may be so engaged, substantially as and for the purpose specified.

3. In an ensilage-cutter, the knife-wheel shaft, a sleeve movable thereon and provided with a diagonal slot; a pin projecting from the shaft through the said slot, and two friction bevel-wheels fast upon the said sleeve, in combination with a counter-shaft adapted to drive the feed-rolls; and a friction bevel-wheel fast thereon, in proximity to the aforesaid friction bevel-wheels so that the above-mentioned pin and slot tend to maintain one of them in contact with the friction bevel-wheel upon the counter-shaft, the said slot running in the direction in which the sleeve has been moved for the purpose of engaging the aforesaid bevel-wheel, but slanting toward the direction from which the main shaft is turning, and the said counter-shaft being adjustable upon the frame so that the friction bevel-wheel thereon may be adjusted toward the knife-wheel shaft to take up wear, substantially as and for the purpose specified.

4. In an ensilage-cutter, the knife-wheel shaft and two friction bevel-wheels slidably supported thereon, and driven thereby, in combination with a counter-shaft adapted to drive the feed-rolls, a friction bevel-wheel fast thereon in proximity to the aforesaid friction-wheels and means for moving the said friction-wheels on the knife-wheel shaft so that either may be placed in contact with the friction-wheel on the counter-shaft, and a bearing for the counter-shaft made adjustable upon the frame so that the friction bevel-wheel thereon may be adjusted toward the knife-wheel shaft to take up wear, substantially as and for the purpose specified.

5. In an ensilage-cutter, the knife-wheel shaft; a sleeve movable thereon and provided with a diagonal slot; a pin projecting from the shaft through the said slot, and two friction bevel-wheels fast upon the said sleeve, in combination with a counter-shaft adapted to drive the feed-rolls; and a friction bevel-wheel fast thereon in proximity to the aforesaid friction bevel-wheels so that the above-mentioned pin and slot tend to maintain one of them in contact with the friction bevel-wheel upon the counter-shaft, the latter being made adjustable upon the frame so that the friction bevel-wheel thereon may be adjusted toward the knife-wheel shaft to take up wear, substantially as and for the purpose specified.

6. In an ensilage-cutter, a lower feed-roll, the feed-roll shaft suitably supported and driven, and a gear-wheel upon the shaft, in combination with a vertically-movable upper feed-roll, a shaft for the feed-roll, a gear-wheel meshing with the aforesaid gear-wheel, a bearing for the outer end of the shaft, two lugs fixed to the frame substantially in a line with the mesh of said gear-wheels, and arms depending from said bearing and journaled on said lugs, substantially as and for the purpose specified.

7. In an ensilage-cutter, a fan-casing, in combination with the feed-roll frame and an adjustable guard-plate connected thereto and set forward close to the fan-casing, substantially as and for the purpose specified.

8. In an ensilage-cutter, the combination of the knife-wheel shaft F, the knife-wheel G, the bearing *g*, the cap thereon having a set-screw *i* and the bearing *f* having the sleeve *j* fast on the shaft and the sleeve *j'* screwed upon the said sleeve *j* and abutting against the bearing *b*, whereby the shaft may be adjusted and be held rigidly as adjusted without interfering with its rotary motion, substantially as described.

9. In an ensilage-cutter, a knife-wheel having one or more knife-spokes substantially L-shaped, the shorter arm connected to the hub and the longer to the rim, in combination with a straight knife securely bolted to each spoke, one or more fan-spokes connecting the knife-spokes with the rim and fan-blades connected thereto substantially as and for the purpose specified.

10. In an ensilage-cutter, a knife-wheel having one or more knife-spokes substantially L-shaped, the shorter arm connected to the hub, and the longer to the rim, in combination with a straight knife securely bolted to each spoke by a series of bolts along the back and one at either or both ends near the edge, and one or more fan-spokes connecting the knife-spokes with the rim and fan-blades connected thereto, substantially as and for the purpose specified.

Signed at Toronto, Canada, February 9, 1898.

OSCAR E. BRAY.

In presence of—
JOHN G. RIDOUT,
A. J. COLBOURNE.