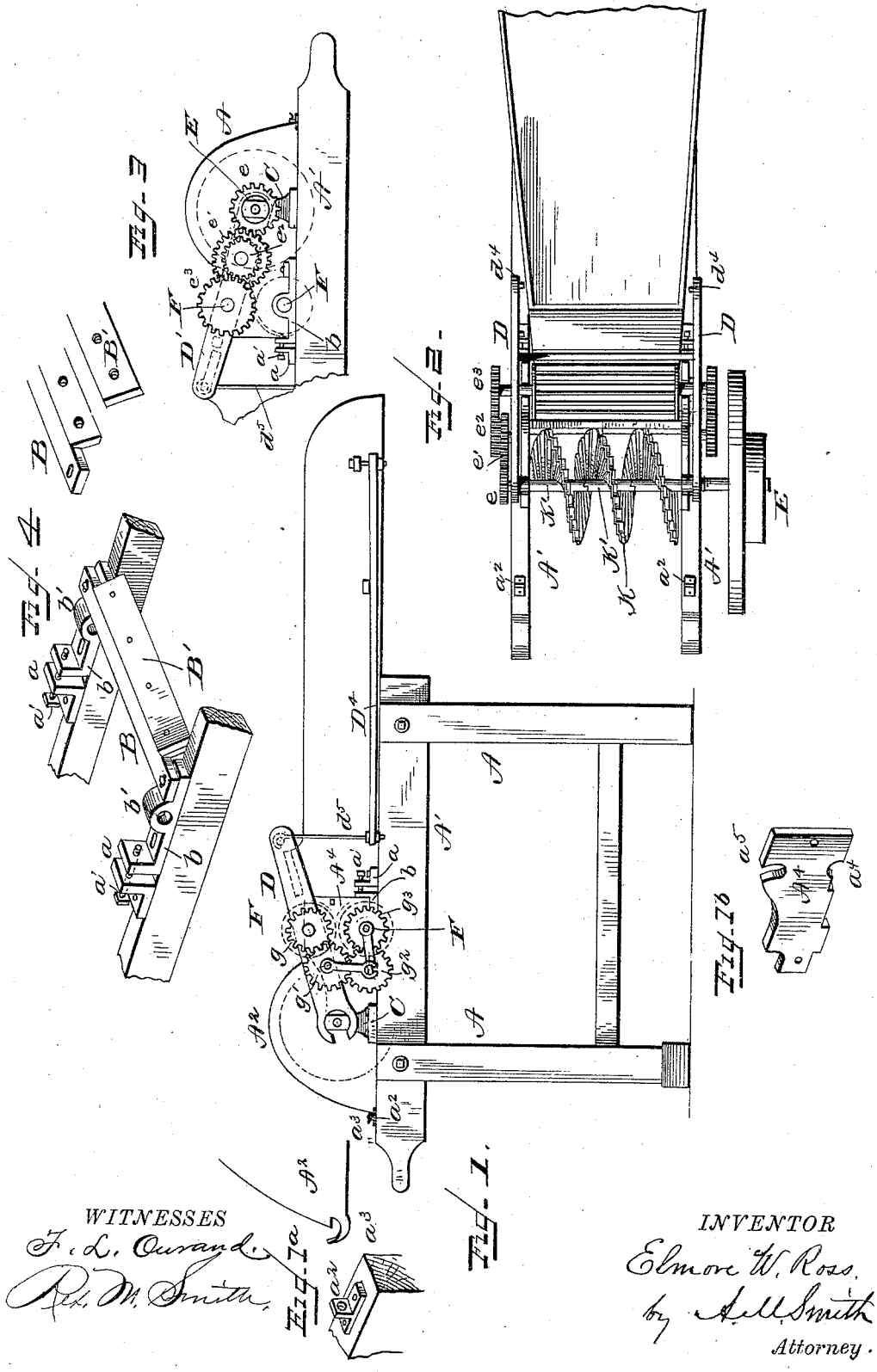
(No Model.) 3 Sheets—Sheet 1.

E. W. ROSS.

FEED CUTTER.

No. 417,744. Patented Dec. 24, 1889.



WITNESSES

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(No Model.) 3 Sheets—Sheet 2.

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Fig. 6

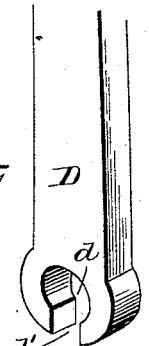


Fig. 5.

Fig. 7

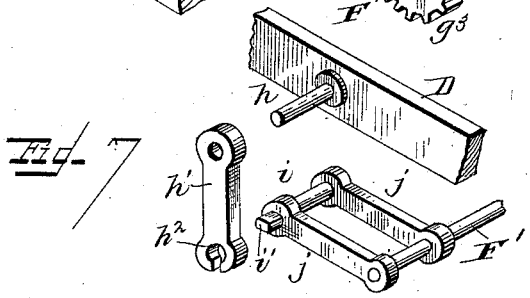
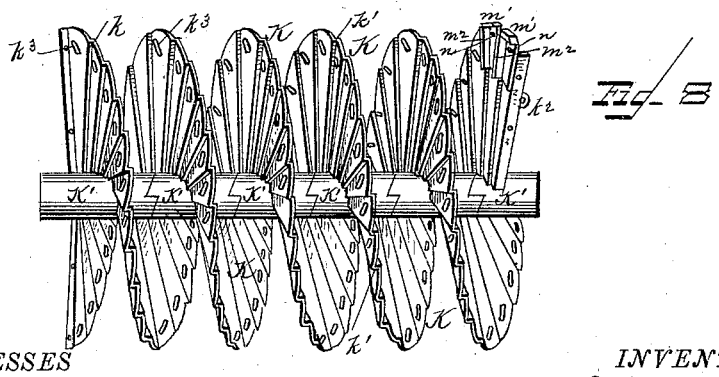


Fig. 8



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(No Model.) 3 Sheets—Sheet 3.

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FEED CUTTER.

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Fig. 11

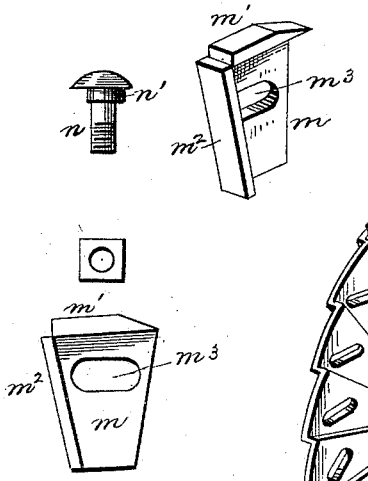


Fig. 10.

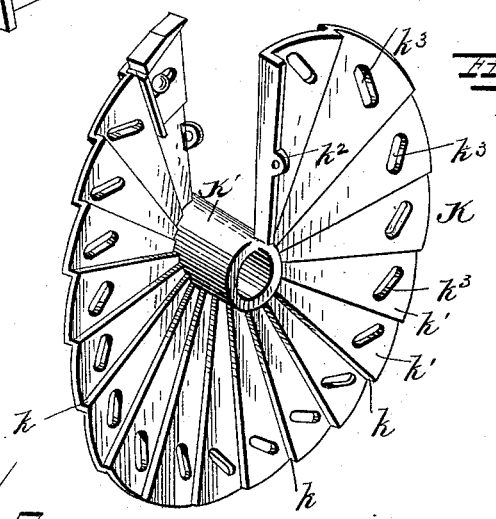
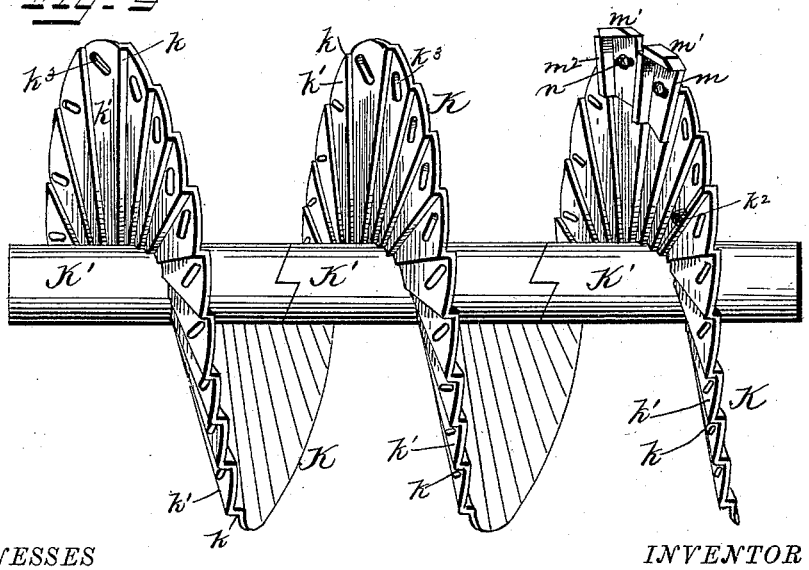


Fig. 9



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UNITED STATES PATENT OFFICE.

ELMORE W. ROSS, OF SPRINGFIELD, OHIO.

FEED-CUTTER.

SPECIFICATION forming part of Letters Patent No. 417,744, dated December 24, 1889.

Application filed January 17, 1888. Serial No. 260,993. (No model.)

To all whom it may concern:

Be it known that I, ELMORE W. ROSS, of Springfield, in the county of Clark and State of Ohio, have invented a new and useful Improvement in Feed-Cutters, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, making part of this specification.

My invention relates to the construction of the cutting-cylinder and of the sectional knives or shredders therefor; to the manner of connecting the stationary knife-bar and the stationary or non-yielding feed-roll whereby they are made adjustable together and held always in proper working relation to each other; to the pivoted bars or frame carrying the yielding feed-roll; to the construction of said bars and of the boxes for the cutting-cylinder shaft for adapting the bars to be readily connected to and disconnected from said boxes; to the arrangement of gearing connected therewith, and to certain other details of construction and arrangement of parts for improving the machine and giving easier access to various parts for adjustment or repair, all as hereinafter described and claimed.

The machine hereinafter described and shown in the drawings is adapted for use in cutting all kinds of fodder and ensilage, but is especially designed for shredding corn-fodder and reducing it to a fine soft food for stock.

In the accompanying drawings, Figure 1 represents my improved machine in side elevation; Figs. 1^a and 1^b, detail views of parts of the cutter-frame and hood. Fig. 2 is a plan view of the machine. Fig. 3 is a side elevation of a portion of the machine, the opposite side to that shown in Fig. 1. Fig. 4 shows, in perspective, a portion of the upper longitudinal frame-timbers, with the adjustable boxes for the stationary or unyielding feed-roll, showing the stationary knife-bar and holder attached and portions of said knife bar and holder detached. Fig. 5 is a perspective view of the frame carrying the yielding feed-roll and of the gearing for driving said roll. Fig. 6 is a detail view showing the construction of the joint between the yielding feed-roll frame and the bearings for the knife-cylinder shaft, and Fig. 7 a similar view of the hangers for connecting the gears for actuating said roll with its supporting-frame. Fig. 8 is a face or front view of the cutter-cylinder, and Fig. 9 a similar view, enlarged, the one showing the cylinder provided with a double spiral and the other with a single spiral for the cutters, and each with two of the cutters applied. Fig. 10 is a perspective view of one of the spiral knife-holders of the sectional or divided cutter-cylinder with one of the knives secured thereto. Fig. 11 shows the form of the knives and the means for securing the same to and adjusting them on the spiral knife-head.

The upright frame of the machine (indicated by A and A′) is of any usual or preferred construction. Upon the upper longitudinal bars thereof are rigidly secured angle-irons *a a*, and behind these on said bars are bearing blocks or irons *b b*, having each a vertical longitudinal slot through which they are held to the frame-bars by suitable bolts, the slots permitting the longitudinal adjustment of the blocks, which is effected by means of screws *a′* passing through the upright portions of the angle-irons *a* and into corresponding upturned flanges on the bearing-blocks *b*. These blocks are provided at *b′* with bearings for the fixed feed-roll shaft and directly behind these bearings with seats for the ends of a knife-holder B, which is rigidly secured to said irons *b* by through bolts or screws. The holder B is cast in the angle-iron form shown, with the horizontal portion in front with its forward edge in close proximity to the fixed feed-roll, the inclined rear part of the holder forming a seat for the knife-bar B′, which is secured to said holder by screws or through-bolts, the heads of which are countersunk or let into said knife-bar B′, so as to be flush therewith on their outer faces. These knives are flat rectangular bars, which can be turned or reversed as the angles become dulled or injured until all the angles have been used, thereby making them much more durable than where only one of the angles or corners is adapted for use in cutting.

In rear of the knife-bar B′ the frame-timbers A′ have standard brackets C, secured to them in bearing-sleeves *c*, on the upper ends

of which the cutting-cylinder shaft is mounted. These sleeves project outwardly from the upright portion of the bracket and are flattened on their outer, front, or rear sides to adapt them to receive the slotted ends of the side bars D and D′ of the yielding frame carrying the upper feed-roll. The slots d' in the ends of bars terminate in circular openings d, of a diameter fitting the unflattened stud portion of the sleeves c for pivotally supporting said bars thereon and holding them engaged therewith, except when the bars are raised to a vertical position, as shown in Fig. 6, when they can be readily lifted off the sleeves.

The bars are connected near their outer swinging ends by a rigid transverse bar D^2, and together support the gearing for actuating the feed-rolls, as follows: The bar D′ is provided with a pendent arm D^3, in which, and bar D′, a series of perforations d^2 are formed at different distances from the cutter-cylinder shaft to receive a pin or stud d^3, which is detachably secured in one of said perforations by a nut, as shown, or in other suitable manner, and can be transferred from one to another of said perforations for adapting the stud to receive gears of different diameters for changing the feed.

On the cutting-cylinder shaft E, to which motion is communicated in any usual or preferred way, is secured a gear-wheel e, which engages and drives a wheel e' on the stud d^3, and having clutched or otherwise attached to its outer face or side a pinion e^2, which engages and drives a gear-wheel e^3, fast on the end of the upper feed-roll shaft F, which is mounted in suitable bearings f in the bars D D′. By adjusting the stud d^3 and substituting for the connected gears e' and e^2 thereon other gears of different relative diameters to suit such changed position of the stud, the speed of the feed-roll shaft F can be changed for varying the feed as desired. The opposite end of the shaft F carries a gear-wheel g, engaging a gear g', mounted loosely on a stud h on the bar D. The outer end of the stud h supports a pendent link h', the lower end of which has a circular perforation h^2, forming a bearing for the outer end i' of a stud-shaft i. The end i' is flattened on its upper and lower sides to adapt it to pass into and out of the bearing through a slot in the end of link h', opening into bearing h^2, as shown, the construction being similar to that of the bars D and sleeve-bearings C, above described, and permitting the link h' and the double link $j\,j$, connected to stud-shaft i, to be readily connected or disconnected when brought into the same plane, or nearly so.

The stud-shaft i has a gear-wheel g^2 mounted loosely on it between the link-bars and in mesh with gear g', receiving motion therefrom, and with a gear g^3 on the fixed feed-roll shaft F′ for driving the latter. The links $j\,j$ are on opposite sides of the gears g^2 and g^3, and are journaled loosely on the shaft F′, the arrangement described permitting the gear g^2 to swing or vibrate around the gear g^3 to accommodate the movements of the bars D and D′, carrying the upper feed-roll. By raising the bars D and D′ until the link h' is brought into line with the links j, said bars and link h' can be released from the links j and gears g^2 and g^3, and by raising the bars D and D′ to a vertical position they can be released from their supports C, as explained. The bars D and D′ have pins d^4 at their outer ends, and links d^5, having hooks on their upper ends, connect said bars with spring-bars D^4 or weights for holding the upper roll down to its work.

The side bars A′ have small upright perforated ears a^2 secured to them near their rear ends, and the hood A^2, covering the cutting-cylinder, is provided at the rear ends of its side plates with hook-shaped projections or spurs a^3, which engage the perforated ears a^2, the spurs a^3 curving upward, as shown in Fig. 1^a, and permitting the removal of the hood A^2 only when the latter is swung upward into an upright position, thereby preventing its accidental displacement.

A^4 (see Fig. 1^b) indicates one of the removable plates at the sides for preventing the lateral escape of the cut material.

In the construction above described supports are provided on the frame A and swing-bars D D′ for all the mechanism described, and the usual side-gear plates which prevent the lateral escape of the material are not required, and I substitute the removable side boards A^4 therefor for keeping the material from getting into the gearing and for giving ready access to the inclosed parts of the machine when desired. The position of this plate is shown in dotted lines, Fig. 1, and its formation in Fig. 1^b. It rests at its forward end on the bearing-plate b, being recessed for that purpose and having a semicircular recess at a^4 over the bearing b', and at its rear end rests on the foot-flange of the standard C, and is secured to the inner face of said standard by a screw or other fastening device. It is recessed also on its upper edge at a^5 to admit the shaft of the movable roller and has its forward end bolted or otherwise secured to the outer face of the rear end of the side board of the feed-box, as indicated. These side plates A^4 can be readily removed, when desired, and when in place effectually prevent the escape of material at the sides and into the gearing.

The knife-cylinder is composed of a stepped spiral flange or disk K, formed on and extending around a sleeve K′, adapted to be slipped on and engaged with the knife-cylinder shaft E, one such casting forming a complete circle and constituting a knife-head. At times, however, where the cylinder is too long to be conveniently cast in one piece, I place two or more of such heads on the shaft and provide their hubs on their adjacent ends with clutch-faces, as shown, so that one

of them being secured to the shaft it will serve to drive the others.

By making the knife holders or heads as described each knife-supporting surface throughout the circle is formed in one piece with that in front and also with that behind it, all joined by a continuous stepped web and each supporting and bracing the others throughout the circle. The spiral plates K terminate, preferably, each in a lateral flange or lip constituting a riser to the first knife-supporting surface of the adjoining plate, and provided with a lug or ear k^2 (shown) for adapting it to be bolted to a corresponding ear on said adjoining plate; but other means may be used for uniting the sections. The several spiral sections making up the cylinder thus united each helps to support the others throughout the cylinder. In Fig. 8 the spiral is a double one, each sleeve having two half-circle spiral flanges set opposite each other on the sleeve and arranged to form a double spiral row of holders instead of a single one, as in Fig. 9. This arrangement has the advantage of bringing two knives opposite each other in the same plane, and so of giving two cuts in each revolution of the cylinder instead of only one across the stationary knife-bar. Otherwise the construction of the spiral knife-holder is the same as that shown in Fig. 9, and above described. The ends of the sleeves K′ are clutch-faced, as shown, so that when one at the end of the shaft is keyed or otherwise fastened to the shaft E to revolve with it, and the others are placed on the shaft, they will all connect with and be drawn by said end sleeves, but they may be connected with the shaft to receive motion therefrom in any suitable manner.

The form of the cutters proper is shown in Fig. 11, in side elevation and in perspective. It is made from a single plate m, of thin steel, made tapering inward and a square piece being removed from its outer rear edge. Its outer end and its heel edge are bent on the same side to a position at right angles to the body of the cutter, as shown at m' m^2. The lip m' is beveled at its forward end and on its outer face to an edge, as shown, and forms a narrow chisel-shaped cutter-section, which acts on cornstalks to cut a narrow strip therefrom, the following heel projections m^2 acting as hammers to break off what is cut by the knives m'. The knife-plates m have slots m^3 formed in them, which cross obliquely slots k^3 in the holder-surfaces of the spiral plates K, and said plates m are placed on the spiral plates with their rear or heel edges m^2 abutting against the radial steps or shoulders k of the spiral plate K. The knives are secured to the spiral disks by bolts n passing through the slots m^3 and k^3, and by loosening the bolts n and moving them up or down in the oblique slots k^3 they serve to crowd the plates m in or out of the holder-surfaces as desired, when the bolt is again tightened to hold them. The bolt n is provided adjacent to its head with a cam or eccentric n', which rests in the slot m^3 in the knife-plate, so arranged that by turning the bolt said cam will be made to effect a further adjustment of the knife-plates when required.

From the above description it will be readily seen that while the cutter described may be used to advantage in cutting all kinds of feed, it is more particularly adapted to the cutting into minute pieces or shredding of cornstalks as the spiral arrangement of narrow sectional cutters following each other in rapid succession and each cutting off a small slice makes such operation easy as compared with other forms of cutters, and the construction of the knife-heads gives to the knives a strong, connected, and continuous bracing support.

Having now described my invention, I claim as new—

1. The pivoted and vibrating frame, in which the movable feed-roll shaft is journaled, having a pivotal center concentric with a gear-shaft, from which said feed-roll shaft is actuated and provided with an interposed stud-shaft, in combination with gears on said feed-roll shaft and its actuating-shaft and the interposed connecting-gear on said stud-shaft, substantially as described.

2. In a feed-cutter, the combination, with the machine-frame, of a pivoted and vibrating frame detachably connected with said machine-frame, the feed-roll shaft journaled in and vibrating with said pivoted frame, the fixed feed-roll shaft, the gears on said feed-roll shafts, the interposed connecting-gear, and the jointed links supporting said connecting-gear, the parts of which links are detachably connected, substantially as described.

3. The combination, with the feed-rollers and the gearing for operating the same, of the side plates or boards interposed between said rolls and gearing for confining said rollers at their ends and for protecting said gearing, and made removable for giving access to the machine, substantially as described.

4. A knife-cylinder head or casting made in the form of a stepped or zigzag spiral web or flange, formed upon and extending around a central hub, and whereon a series of steps or offsets are formed for the reception of the cutters, substantially as described.

5. A knife-cylinder head or casting made in the form of a stepped continuous zigzag spiral flange or web extending from and around a single central hub or sleeve, in combination with the cutters secured on said stepped flange, each succeeding cutter on one side of the plane of the cutter in advance of it, substantially as described.

6. The stepped spiral disks or flanges the several steps of which are formed in one piece with connecting-webs, which support and brace each other continuously throughout the entire plate, in combination with knife-plates provided with the angular cutter-sections and

the angular heel projections, substantially as described.

7. The combination of the stepped spiral disks forming the knife-heads and the knife-plates adjustable thereon, one of which parts is slotted to permit the adjustment of the knives of the through retaining-bolt, substantially as described.

8. The combination of the stepped spiral knife-head disks, the knife-plates on said disks, and through connecting-bolts provided with cams or eccentrics for adjusting said plates, substantially as described.

In testimony whereof I have hereunto set my hand this 10th day of December, A. D. 1887.

ELMORE W. ROSS.

Witnesses:
REX SMITH,
EWELL A. DICK.