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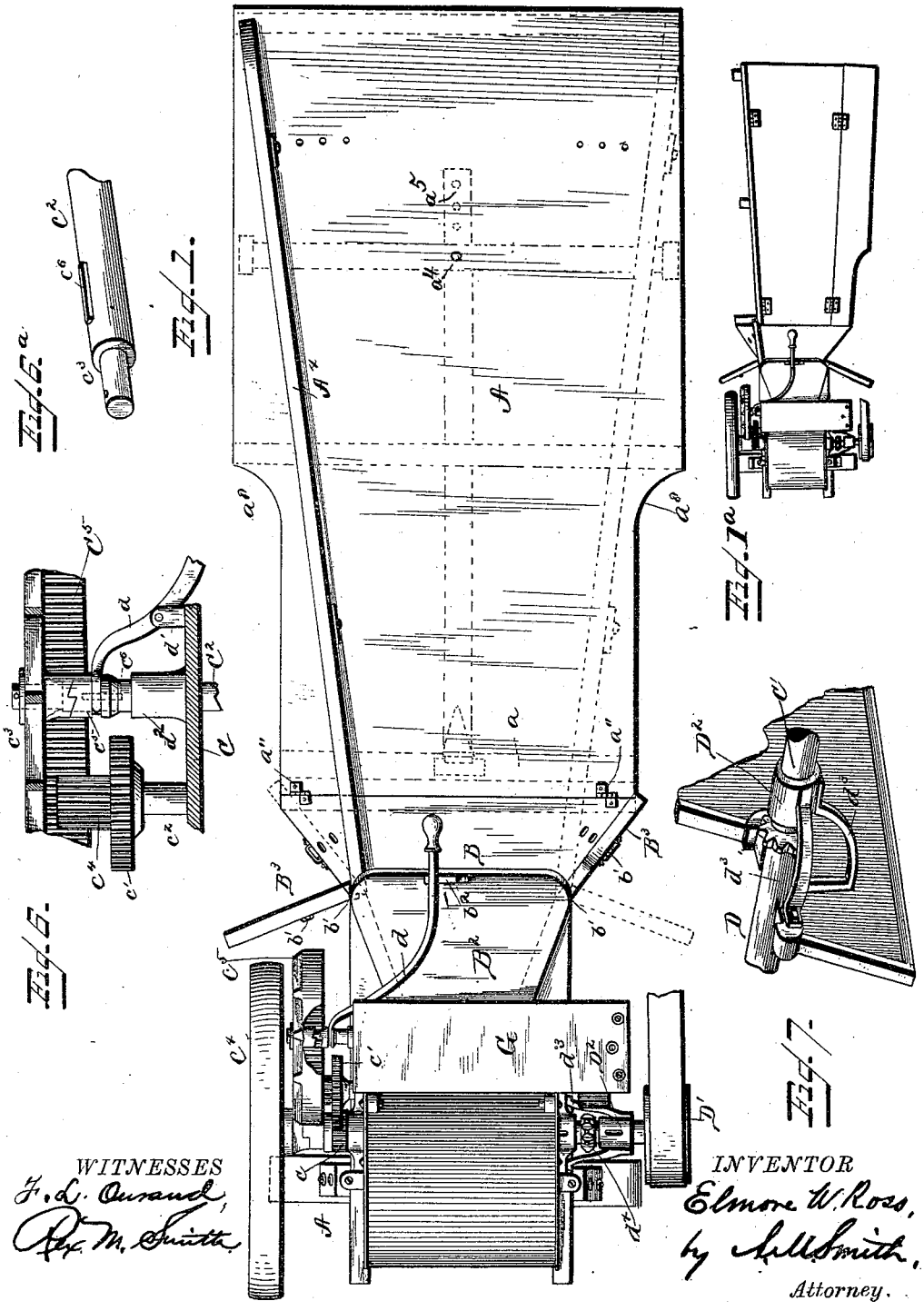
E. W. ROSS.

FEED CUTTER.

No. 454,920. Patented June 30, 1891.



WITNESSES
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FEED CUTTER.

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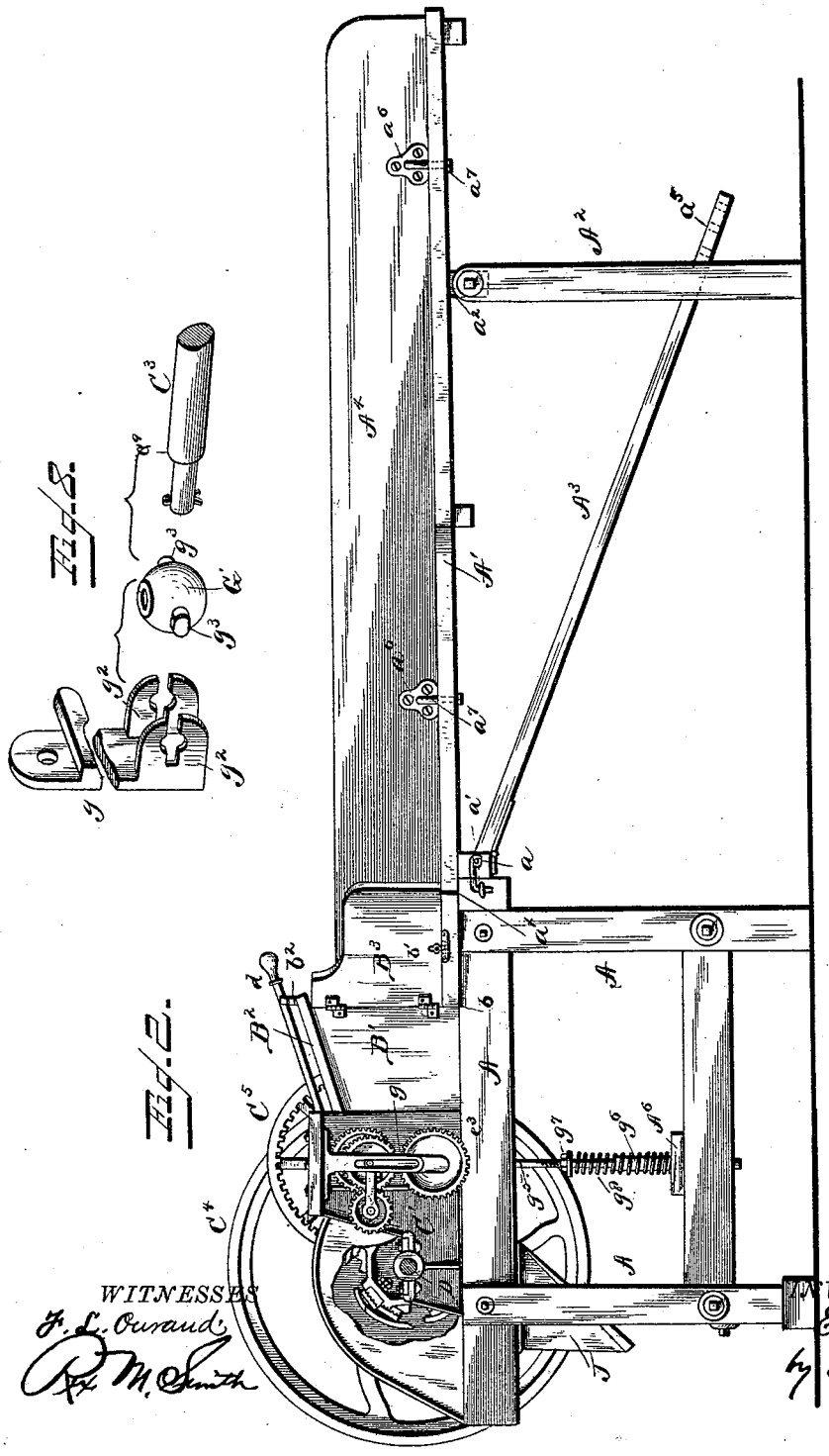

Fig. 2.

Fig. 3.

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FEED CUTTER.

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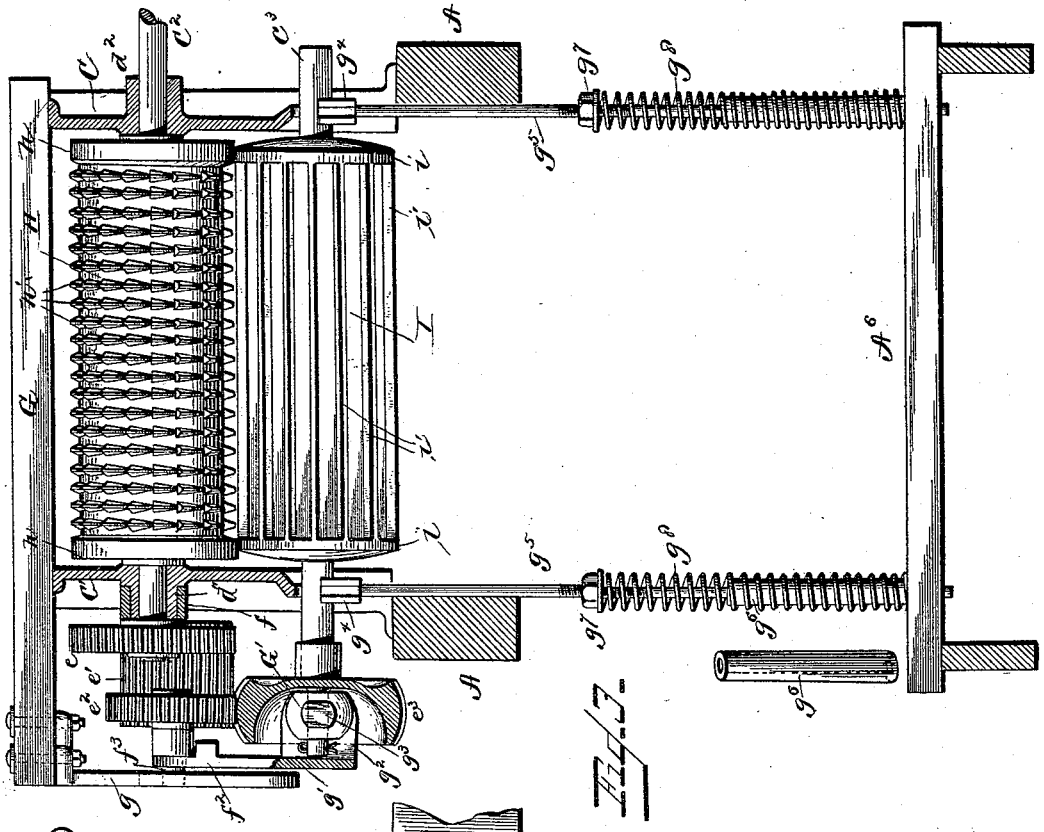

Fig. 1.

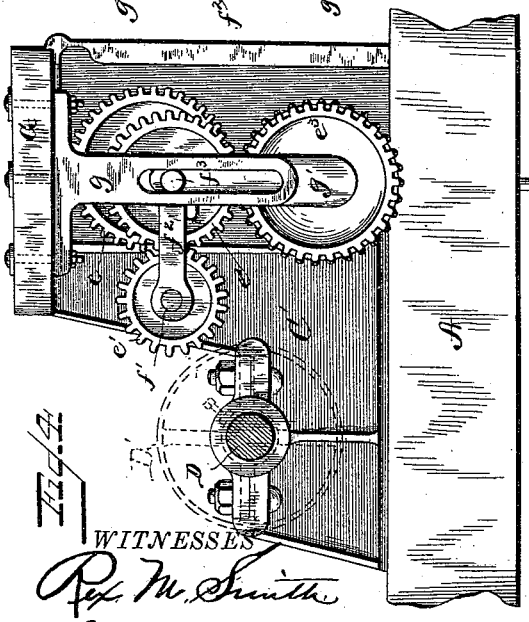

Fig. 4.

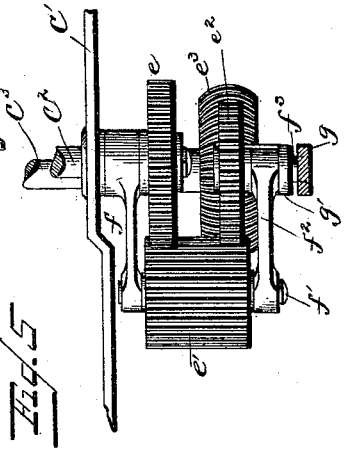

Fig. 5.

WITNESSES

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(No Model.) 6 Sheets—Sheet 4.

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No. 454,920. Patented June 30, 1891.

Fig. 10.

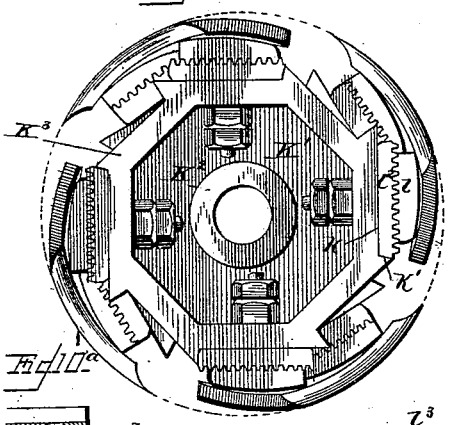


Fig. 10a.

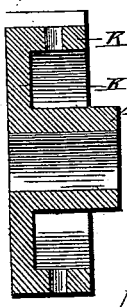


Fig. 14.

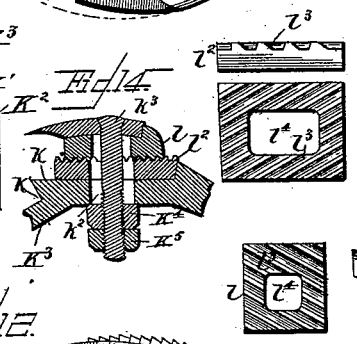


Fig. 9.

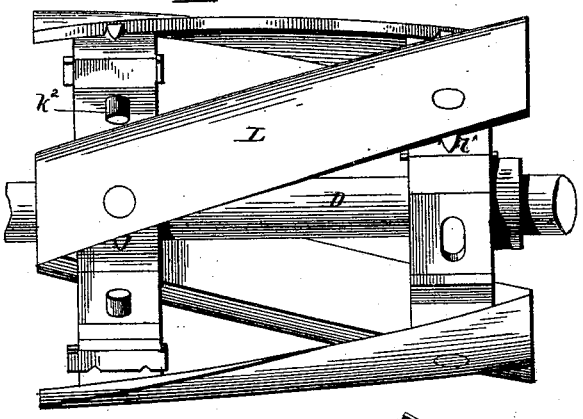


Fig. 15.

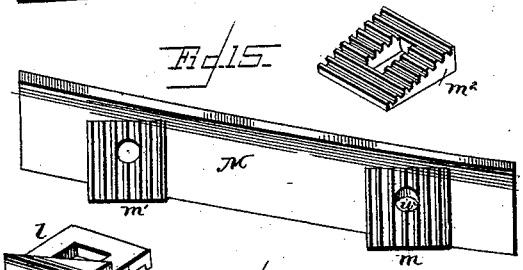


Fig. 11.

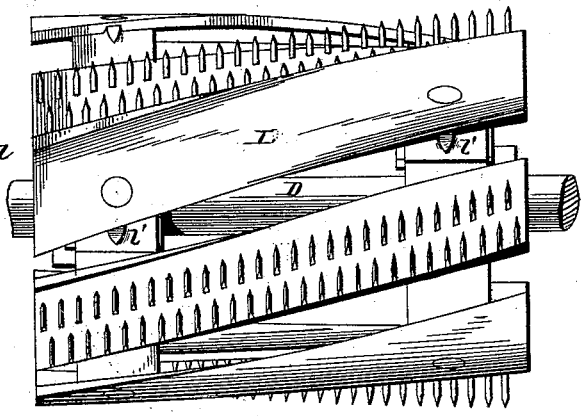


Fig. 12.

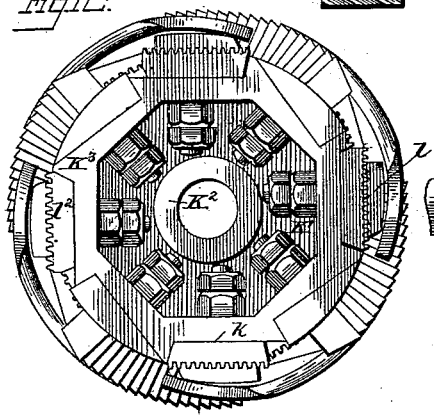
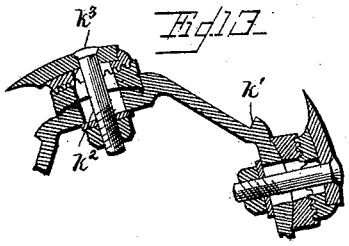


Fig. 13.



WITNESSES

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(No Model.) 6 Sheets—Sheet 5.

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FEED CUTTER.

No. 454,920. Patented June 30, 1891.

Fig. 16.

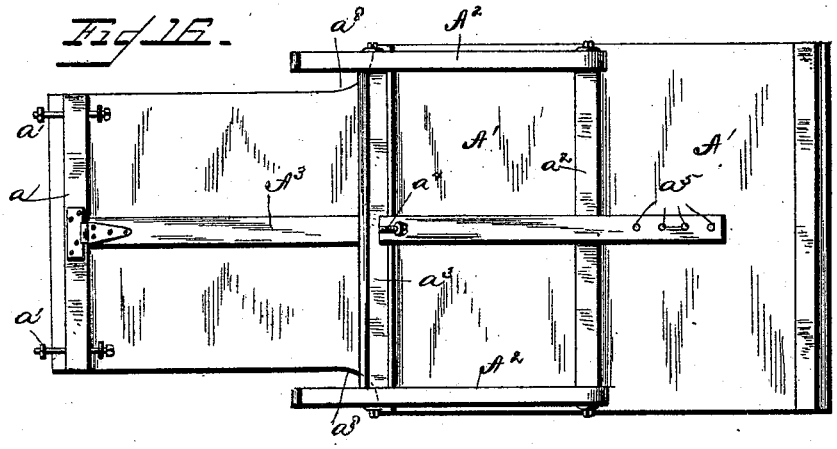


Fig. 17.

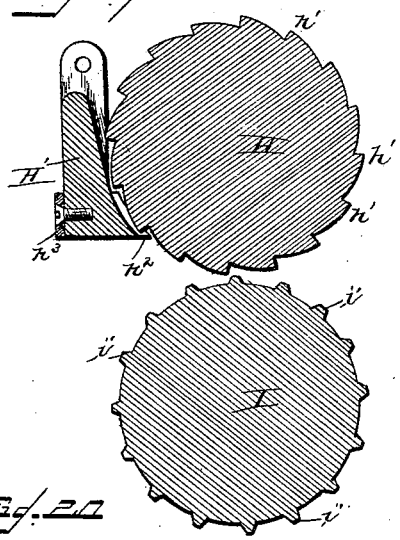


Fig. 18.

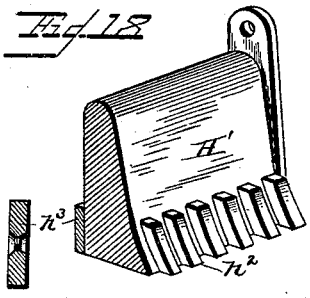


Fig. 19.

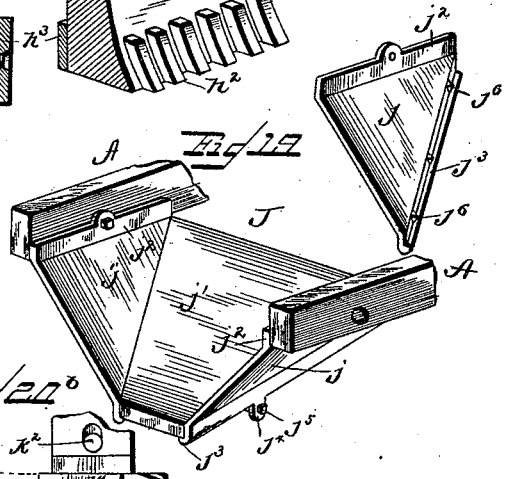
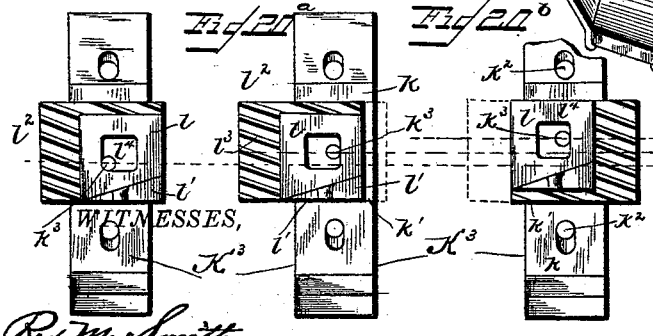


Fig. 20.

Fig. 20a.

Fig. 20b.



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(No Model.) 6 Sheets—Sheet 6.

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FEED CUTTER.

No. 454,920. Patented June 30, 1891.

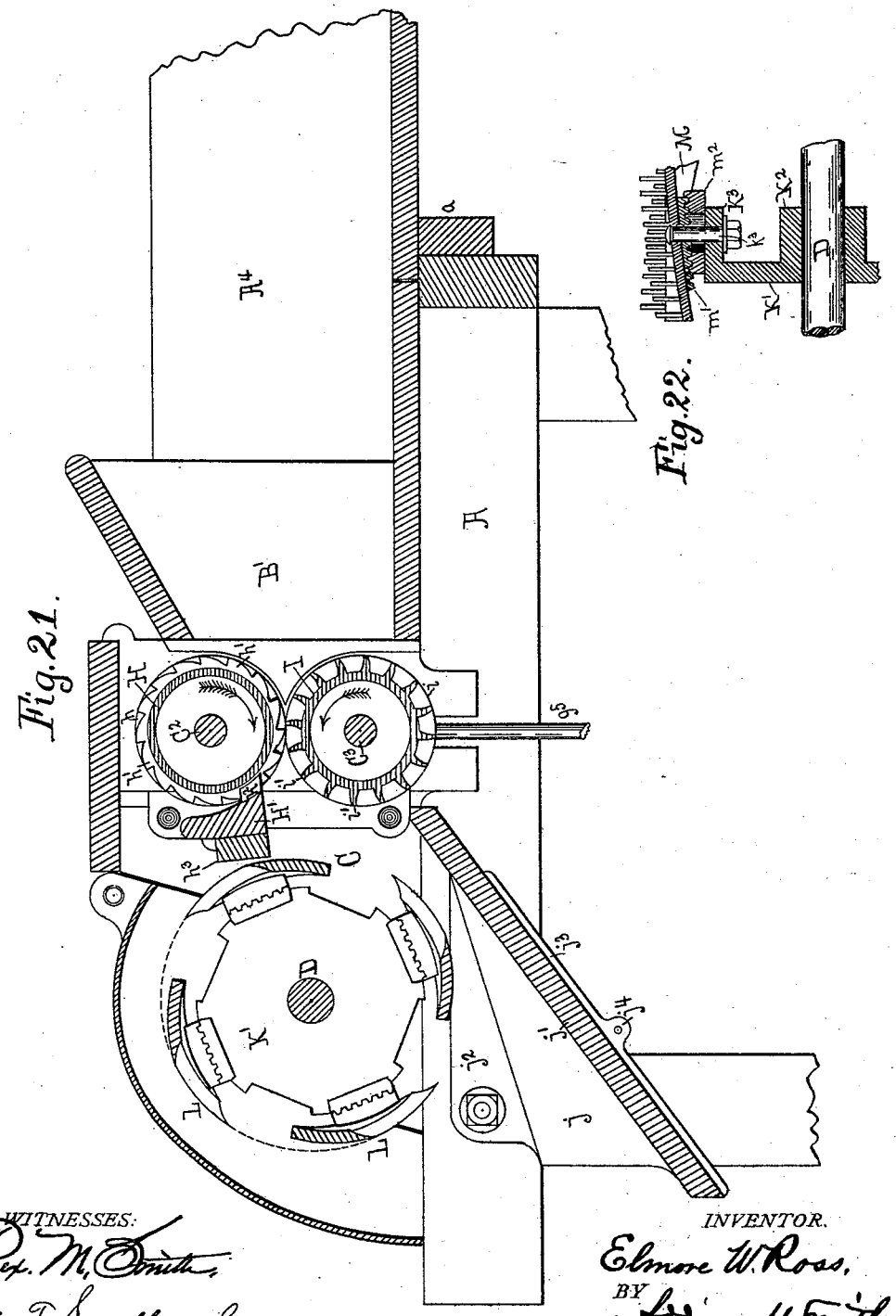

Fig. 21.

Fig. 22.

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UNITED STATES PATENT OFFICE.

ELMORE W. ROSS, OF SPRINGFIELD, OHIO.

FEED-CUTTER.

SPECIFICATION forming part of Letters Patent No. 454,920, dated June 30, 1891.

Application filed January 17, 1888. Serial No. 260,992. (No model.)

To all whom it may concern:

Be it known that I, ELMORE W. ROSS, of Springfield, 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 details of construction and arrangement of various parts of a machine for cutting fodder, and will be understood from the following description and claims, reference being had to the accompanying drawings, in which—

Figure 1 is a plan view of a machine having my improvements, and Fig. 1ª shows a modification in the feed-table extension; Fig. 2, a side elevation of the same with the cylinder-hood partly broken away. Fig. 3 represents a transverse vertical section taken in front of the feed-rolls and showing the latter in elevation. Fig. 4 shows in side elevation the gears that connect the fixed and yielding feed-rolls and their connecting devices and supports, and Fig. 5 is a plan view of the same. Fig. 6 is a broken plan view showing the stop mechanism or means for throwing the feed-rolls out of action, and Fig. 6ª a portion of the upper or fixed feed-roll shaft. Fig. 7 is a perspective view showing the bearing-bracket, giving an outer or third bearing to the cutting-cylinder shaft. Fig. 8 shows in detail the parts of the support and bearing for one end of the yielding feed-roll shaft. Fig. 9 is a plan view of the cutting-cylinder; Fig. 10, an end view thereof, and Fig. 10ª shows a section through one of the cylinder-heads. Figs. 11 and 12 are views similar to Figs. 9 and 10, showing the slitting-knife plates applied to the cylinder alternating with the cutting-knives. Fig. 13 is a broken section through the cylinder-head, showing a modification in its form of construction. Figs. 14 to 20ᵇ, inclusive, show parts of the machine, hereinafter referred to, in detail. Fig. 21 is a vertical longitudinal section through the cutter and a part of the feed-table extension, and Fig. 22 a vertical section through a portion of one of the cylinder-heads and shredder-knives.

A indicates the upright rectangular frame of the machine, which may be of any usual or preferred construction, except that its forward transverse timber projects slightly beyond the forward end of the flooring of the fixed feed box or hopper, as shown at $a^{\times}$, to adapt it to receive the rear end of the feed table or tray, the rear end of which rests on and is connected with the forward upper cross-bar of the frame A by any suitable connecting devices, such as butt-hinges a'', which permit the table to be folded up or detached, or bolts a' a', passing through said bar, and a bar or cleat a, adjoining and parallel with it, secured to the bottom of the tray-flooring, (see Fig. 16,) may be employed. The flooring is made wide and is secured to a number of transverse bars or cleats, one of which a^2 has an upright frame A^2 hinged to it, which, when the table is attached to the machine-frame for use, forms a leg or support to the outer end of the table, but when the table is detached for transportation folds up against the table, as shown in the bottom view, Fig. 16. A brace A^3, hinged to the rear cross-bar or cleat a, extends obliquely downward and forward to a lower transverse bar a^3 of the hinged support A^2, and is secured thereto by a bolt or screw a^4, passing through one of a series of holes a^5 near the end of the brace, and by means of which the leg-support A^2 may be adjusted as required for giving the proper height to the forward end of the table. The brace A^3 can also be folded up against the table for transportation, as shown in Fig. 16.

The flooring of the tray when in use forms an extension of and abuts against the flooring of the hopper or fixed feed-box B of the machine, through which the material to be operated upon is fed to the feed-rolls and cutting-cylinder. The sides B′ of this mouth or hopper converge rearward toward the feed-rolls, and the upper side or wall is also made to converge or incline toward the flooring in the same direction, the converging sides and top forming a diminishing throat and directing the material properly to the feed-rolls.

The sides B′ are provided with hinged or removable and adjustable flaps or wing-board extensions B^3, one or both of which can be folded back or removed to give place to the extended end of the side board or boards A^4 of the tray when such boards are used. The side board A^4 can be adjusted to any desired

angle with either side of the hopper, to which it forms an extension, and the wing-boards B^3 can also be adjusted upon the flaring bottom of the mouth or hopper B for facilitating the admission of the material to be operated upon and guiding it to the feed-rolls.

The table or tray is made of any required width near its forward end for receiving and spreading the material, but is cut away on its sides and contracted in width at a^8 to about the width of the outer end of the flooring of the flaring mouth of the hopper B to enable the attendant to work close up to the mouth of the hopper.

The floor of the hopper B in front of the flaring fixed sides from a point or points b b is made still more flaring to accommodate the adjustable wing-boards B^3. The wing-boards or flaps may be held at any desired adjustment by a pin or button b' entering notches in the flooring, or other suitable device may be used for this purpose. Ordinarily but one side board A^4 is required, as shown; but two can be used, and they can be applied to either or both sides of the tray, as indicated by full and dotted lines in Fig. 1. It has plates a^6 secured to it, provided with pendent pins a^7, which pass through perforations in the tray-floor and are screw-threaded on their ends to receive nuts, by means of which the side board is clamped to the tray-flooring, as shown.

Fig. 1^a shows the side boards A^4 hinged to the table. Where this construction is used, one or both of the side boards can be turned down to form an extension of the table in width, or one can be turned down for the purpose described, while the other is in position to direct the material to the fixed feed box or hopper. In this construction floor cleats or brackets may be used to support the side boards when turned down.

The frame A has castings or gear-plates C and C′ secured to its upper longitudinal frame-bars, said castings being provided with sleeve-bearings and slots for the cylinder and feed-roll shafts, similar to those described in another application filed by me January 17, 1888, Serial No. 260,991.

C^2 indicates the shaft of the upper or non-yielding feed-roll; C^3, that of the lower or yielding roll, and D the shaft of the cutting-cylinder. The shaft D has a driving or band wheel D′ on one end and a fly-wheel C^4 secured to its other end, and intermediate of said last-named wheel and the gear-plate C said shaft has a gear-wheel c mounted loosely upon it, but clutched to the wheel C^4 to rotate with it. The gear c engages and drives a spur-gear c' on a stud-shaft c^2 on the gear-plate C. The gear c' has a pinion c^4 secured to its outer face, which engages the internally-toothed rim of the wheel C^5 on the upper or fixed feed-roll shaft for driving the latter. The gear-wheel C^5 is loose on the shaft C^2, and is held in place thereon against a shoulder c^3 on said shaft by means of a washer and pin. Without the shoulder c^3 the gear would slide into contact with the clutch and defeat the object sought.

The hub of the wheel C^5 has a clutch-face on its inner end, and the shaft C^2 has a clutch c^5 connected to it by a spline c^6 and groove adapted to connect the wheel C^5 to its shaft for driving the latter. The clutch is grooved, and the forked end of a lever d, pivoted in a bracket d' on the gear-plate C, enters said groove. The lever is curved or bent so as to bring its handle end over the machine to a point near the center of its width to make it convenient to operate from either side. When from any cause it becomes necessary to stop the feed, the attendant by operating the lever d can throw the clutch out of engagement with the wheel C^5, and while the latter will continue to revolve the shaft C^2 and the upper feed-roll thereon, together with the lower or yielding roll geared to said shaft, as hereinafter described, will be thrown out of gear with wheel C^5, and the feed will instantly stop until the clutch c^5 is again thrown into engagement with wheel C^5.

The end of the sleeve d^2, in which the shaft C^2 has its bearing, forms a stop to limit the throw of the clutch c^5 away from the wheel C^5, and a notched or shouldered plate at b^2 on the hopper B serves to hold the lever d at either end of its throw or adjustment.

I locate the feed "stop" mechanism at the point described for two reasons—viz., that the feed-roll shaft moves at a very low speed compared with that of the main driving and intermediate shafts and there is consequently less liability of breaking the clutch-teeth, and, secondly, because it frees the feed-roll shaft from the heavy driving-gear and fly-wheels, and so permits it to stop instantly in case of obstruction to the feed-rolls or cutter.

The end of the cylinder-shaft D, carrying the band-wheel D′, projects some distance beyond the gear-plate C′ to get the band-wheel and the band for operating it outside and clear of the gears projecting on the same side of the machine, and hereinafter described, for connecting the feed-rolls. To properly support the extended end of the shaft, I provide a third bearing D^2, in the form of a sleeve, on the outer end of a tripod or arms d^3 d^3 d^3, the inner ends of which have perforated feet, through which they are bolted to the casting or gear-plate C′. The arms d^3 are sufficiently removed from the shaft D to provide space between them for a small sprocket-wheel d^4, fast on the shaft D between the bearing-sleeve D^2 and the casting C′, and from which motion is communicated to a carrier or other attachment to the machine.

The feed-roll shaft C^2 has on its end opposite that carrying the driving-gear C^5 a spur-gear e, and between said gears and the gear-plate C′ on a sleeve-bearing d'' on the latter is pivoted an arm f, which at its outer swinging end has a stud-shaft f' secured to it, on which is mounted loosely an idle barrel-pin-

ion e' in gear at one end with the wheel e. The outer end of the stud-shaft has a second arm f^2 pivoted upon it, the swinging or outer end of which carries a pin or stud f^3, which projects on both sides of said arm f^2, the stud projection on the outer side entering a guiding-slot in a hanger g, pendent from the overhanging end of the cap-plate G, covering the upper feed-roll, and which serves to protect the driving-belt and keep it out of the feed-gearing. The inwardly-projecting portion of the stud f^3 carries an idle-wheel e^2, which is in gear with the outer end of the barrel-pinion e', receiving motion therefrom, and engages also a round-faced gear e^3 on the shaft C^3 of the yielding feed-roll for driving the latter. The stud f^3 between the slotted hanger g and the arm f^2 has a plate or hanger g' pivoted upon it, said hanger being provided at its lower end with slotted parallel lugs or ears g^2 g^2, adapted to admit and form bearings for trunnions g^3 on a bearing-box G', in which the projecting end of the shaft C^3 is journaled. The bearing box or sleeve G' is shown approximating a globular form flattened at the perforated sides; but a cylindrical form may be used, and the trunnions g^3 are flattened on the sides crossing the sleeve to permit them to be inserted in the narrow slots in the ears g^2. The slots are widened near the center of the width of the ears into circular openings, entering which the trunnions can turn for preventing their accidental displacement and bringing the sleeve into a horizontal position to receive the end of the shaft C^3, which, as shown, is reduced in diameter, forming a shoulder at c^9, against which the inner face or end of the bearing-box G' abuts, a pin in the outer end of the shaft holding the box or sleeve in place thereon.

The round-faced gear e^3 is provided on its inner side with a hub or sleeve, through which it is secured to the shaft C^3 on its larger part, and is made concave on its outer face to permit the bearing-block G' to lie within it far enough to bring its supporting-trunnions into the same vertical plane, or nearly so, with the greatest diameter of the round-faced gear, and which, when the parts are at rest, would also be in the same plane with the gear e^2, meshing with and driving the round-faced gear. This is important, inasmuch as the centrally-located trunnions g^3 serve as pivots on which the round-faced gear e^3 vibrates to accommodate the yielding of the shaft of the yielding feed-roll to unequal or varying thicknesses of material being operated upon at the same time at opposite ends of the roll and holds said round-faced gear as nearly as practicable in its best working relation to its driving-gear e^2. The hanger g' holds the gears e^3 and e^2 in proper relative positions. The arm f^2 holds the gears e^2 and e' always in mesh, and the arm f and stud f' hold gears e and e' in gear, the arm f permitting gear e' to vibrate or swing partly around gear e, and the arm f^2 permitting a corresponding movement of gear e^2 relative to gear e' to accommodate the yielding of the feed-roll.

The shaft C^3 of the yielding feed-roll is journaled in boxes g^4, which slide up and down in slots in the castings C and C', said boxes being upheld by upright rods g^5, which at their lower ends pass through a transverse frame-bar A^6 and through upright sleeves g^6, supported on said bar. The rods g^5 have screw-threads formed upon them up to or near the center of their length to receive nuts g^7, underneath which are placed washers and below said washers spiral springs g^8, extending to the bar A^6 and surrounding the rods g^5 and sleeves g^6, as shown. The springs wrap the sleeves sufficiently closely to be held in an upright position thereby, the sleeves preventing lateral bending or buckling of the springs without being long enough to interfere with the yielding of the shaft C^3 within proper limits at either end independently of the other. By adjusting the nuts g^7 the tension of the springs g^8 can be adjusted as desired.

H and I indicate the feed-rolls on the shafts C^2 and C^3, the first named being fixed and the last yielding, as described. The roller I is fluted or ribbed longitudinally, the ribs i' extending from end to end, the flutes terminating in rolling surfaces i, flush with the outer faces of the ribs i' and rolling in contact with similar rolling surfaces or rings h on the ends of the cylinder H. The roller H is also ribbed or toothed, as will be described, and the rolling surfaces of rings h being flush with or in the same plane with the highest points of the teeth of the roller H all danger of breaking the teeth and all hammering or jolting action of the rolls consequent upon their being ribbed or toothed and pressed together, as described, is avoided. The teeth h' of the roller H are arranged in parallel rows extending around the roller, and the outer face of each tooth is inclined from its rear end (relative to the direction of rotation) and where its projection is greatest to its forward end. The peripheral length of the teeth corresponds preferably with the distance between the ribs i' of the roller I, as indicated in the sectional view, Fig. 17. The heel end of each tooth is its highest point or projects farther from the cylinder, and the teeth taper thence inward to their forward end, and being made by preference wedge-shaped or of dovetail form, they leave spaces of corresponding form between them, into which spaces the material operated upon will be crowded by the ribs i' of the roller I. The two rolls are preferably so placed relatively one to the other and so geared to move together that the teeth of roller H will be intermediate of the ribs and opposite the flutes or depressions of the roller I, the heel or highest points of the teeth moving just in front of a following rib of the opposing roller. By the construction and arrangement of the ribs

and teeth, as described, the ribs are made to crowd the material being operated upon into the spaces between the teeth, and the teeth are made to crowd the material down into the flutes or depressions between the ribs i', and the combined action of the teeth and ribs is such as to grip the material firmly and force it onward to the cutters.

The crowding of the material into the dove-tail-shaped spaces between the teeth h' makes it liable to adhere to and be carried around by the roller H. To prevent this I employ a stripper in the form of a comb H′, secured to the castings C and C′ directly behind the roller H and having a series of teeth h^2 on its forward face, as shown in Figs. 17 and 18, the latter showing a sectional perspective view of the comb. The teeth and their supporting-bar are concave on their forward faces to conform to the periphery of the roller, and the teeth of the comb rest in the spaces between the teeth of the roller and serve to effectually strip the latter of all material adhering to it. The comb-bar serves also as a support for the stationary rectangular knife-bar h^3, which is detachably secured by bolts or screws to the back of said bar at its lower edge, as shown in the detail sectional views, Figs. 17 and 18. This bar h^3 may be removed and reversed or turned so that any of its four angles may be used as the cutting-edge, thereby making it very desirable as compared with the ordinary construction.

Fig. 19 shows in perspective the discharge-chute and also one of the side plates thereof detached. J indicates the chute, composed of side plates $j\,j$, triangular in shape, and an inclined and tapering bottom board j'. The side plates have vertical flanges j^2 at their upper edges, through which they are secured to the upper longitudinal frame-bars under the cutting-cylinder, and on their inclined forward or lower edges with inwardly-projecting flanges j^3, on which the bottom board j rests or is secured. By the construction described the chute is made wide enough to extend the whole length of the cutting-cylinder at its upper receiving end, and is contracted thence to a comparatively narrow discharge-spout at its lower end for condensing the cut material into a narrow stream and discharging it in compact shape, whether upon the ground or into a suitable carrier for removing it. The flanges j^3 may be provided with perforated ears j^4, and a through-bolt j^5, connecting said ears, may be employed for clamping the bottom board in place between the side plates, which have little pointed spurs j^6 on their lower flanges, which enter the ends of the bottom board and prevent its displacement.

Figs. 9 to 15, inclusive, Sheet 4, of the drawings show the cutting-cylinder complete, both for cutting only and for cutting and splitting the material operated upon, its details, and also (in Fig. 13) a slight modification in the form of the cylinder-head, which consists of suitable radial arms or a disk K′, having a central hub K^2, through which it is secured to the shaft D, and a flange K^3, formed upon the outer ends of the arms or periphery of the disk or annular web K′, uniting the hub and rim. Two (or more) of these heads, with the flanges or rims turned outward or away from each other, are employed to form a cutting-cylinder. The rim K^3, instead of being annular and in a true circle, is polygonal in form, having flattened portions or segmental depressions on its periphery and corresponding flattened surfaces on its inner face to adapt the heads to receive the knives, knife-holders, and their clamping-bolts and nuts. The segmental depressions k on the periphery are made, preferably, to assume what may be termed a "tangential" relation to a circle, which would touch their rear ends, (relative to the direction of rotation of the head,) such as will cause the cutting-edges of the knives secured thereto to project a little farther than the heels thereof, thereby giving the knives the required clearance, as indicated by dotted lines, Fig. 10. By this construction the depressions k are made to terminate at their heel ends in shoulders k', which form solid supports to the heel of the knives or knife holding and adjusting blocks. The knives L are spiral-shaped, one end being in advance of the other, as shown, and are secured to the depressions on the cylinder-heads by means of adjusting-blocks and clamping-bolts, as follows: The rim K^3, where the seats or depressions k are formed, has slots k^2 formed in it to receive the clamping-bolts k^3, and upon the seat or depression rests a slotted block or blocks l and l^2, which on their adjacent faces are provided with intermeshing ribs or corrugations l^3. The slots or perforations l^4, through which the bolts k^3 pass to fasten the knife and its holder block or blocks, are made, preferably, that in the part l about square, and that in the part l^2, also rectangular in form, but elongated in the direction of the length of the cylinder, as shown, to permit their adjustment relatively to the knife and its stationary clamping bolt. The part l of the holder has a wedge-shaped rib l', formed upon its outer face, (to which face the knife L is clamped,) said rib conforming on its forward face to the inclined position of the knife and forming a shoulder against which the heel of the knife abuts, as shown. By this construction of the seat-blocks l it will be seen that said blocks may be used alone, seated in the flattened or depressed portions k of the rim K^3, and that by loosening the bolts k^3 and driving the block endwise of the cylinder the wedge l', moving point forward, will crowd the knife forward on the cylinder for setting its cutting-edge out farther and bringing it into the desired relation to the fixed knife-bar h^3; but I prefer to use a second plate l^2 and to form interlocking corrugations or ribs upon and crossing obliquely their adjacent faces, as described, as I am thereby enabled to provide

for increased adjustment of the knife and without making the inclined faces or ribs of said blocks so abrupt or steep as to endanger accidental slipping of the parts.

The operation of the blocks l and l^2 is illustrated in diagram Figs. 20, 20^a, and 20^b. Thus the Diagram 20 shows the position of the blocks on the cylinder-head when the knife is first secured thereto. Now when the knife becomes worn, or when from other cause it is required to advance it, by loosening the bolt k^3 slightly the blocks l and l^2 can be driven endwise together and gradually, as required, until they reach the position indicated in Diagram 20^a, and in which movement the knife will be crowded forward by the wedge l'. In this movement of the block l the bolt k^3, which is stationary and in the first position described was at the forward end of the slot or perforation in block l at the end of said movement, will be at the rear end of said slot, as shown. Now by driving the lower block l^2 in the reverse direction from the position in full lines in Diagram 20^a and by dotted lines in Diagram 20^b to the position shown in full lines in the last-named diagram the block l, carrying the knife K with it, will be gradually crowded forward by the action of the interlocking ribs l^3 until the parts finally assume the third position shown, Diagram 20^b. The slots k^2 in the flange K^3 permit the bolts k^3 to move with the knife as the latter is thrust forward in the adjustments described. By the construction described I am enabled not only to adjust the knives within the required limits, but also to hold them firmly and securely against accidental displacement.

The interlocking ribs or corrugations, instead of being oblique or diagonal, may be straight and parallel with the knife-cylinder shaft, in which case the upper block is driven the whole length of the slot, and then, if further adjustment of the knife is required, the upper block is set forward one or more corrugations and then again driven endwise, as required.

In Fig. 13 the seats on the cylinder-head for the adjusting block or blocks are shown rounded, and the outer angles of the shoulders are also rounded, as shown; but these are obvious modifications not affecting the result.

For insuring the hold of the clamping-bolts and preventing them from becoming loosened accidentally I apply, in addition to the usual nut k^4, a second jam-nut k^5, which serves to prevent accidental backing of the nut k^4, consequent frequently from the jar due to the action of the knives.

Blocks similar to those described may be employed for adjusting the plates or bars M, carrying the slitting-knives; but as the latter require to be moved outward only I prefer to provide the bars M with transverse corrugations or ribs m', formed either on the plate itself or on a separate perforated plate, as preferred, and under these I place in the seats k of the cylinder-head a wedge-shaped slotted plate m^2, (shown detached in Fig. 15,) so that by loosening the bolt securing the plates M and m^2 to the cylinder-head sufficiently to let the corrugations or ribs on plate m^2 pass by the ribs m' the wedge m^2 can be thrust farther under the ribbed plates or projections on the bar M for moving the latter outward as far as required, when by again tightening the bolts the plates will be held secured to the cylinder-head. The slitting-knife plates need be used only where the character of the material operated upon requires it, and when used are arranged to alternate with the cutting-knives L, as shown. The bars M are spiral in form, resembling the knives L in form and arrangement on the cylinder, but without cutting-edges. The slitting-knives are formed upon or secured to said bars in parallel spiral rows extending from end to end of the bars, with the slitting-knives in one row set opposite the spaces between the knives of the preceding row and sufficiently behind the latter to allow the knives of one row to clear themselves before those in the succeeding row begin to act, thereby preventing the wedging of the material between them. These slitting-knives are thin blades projecting radially of the cylinder from the bars M, and are beveled to an edge on their forward edges and so arranged as to split finely the material operated upon.

Among the advantages of the construction described the following may be enumerated:

It is of great importance in ensilage and fodder cutting machines that the feeding of the same shall be even, continuous, and unbroken, and that the speed of the cutting-cylinder and fly-wheel always remain the same, as thereby a greater quantity or thickness of feed may be put through the cutter. The sudden strain of heavy and light feeding which causes the checking or acceleration of the speed is thus avoided, and is, together with the danger and expense of breakage, reduced to a minimum. With the short and contracted feed-box heretofore provided all these points of advantage have been impossible, because they could not hold upon their surface a sufficient quantity of material to produce an even continuous feed. Cornstalks, being long, would sag down at the ends of the box and could be drawn in only with difficulty and loss of time, while by the variations of the feed passing through or its entire stoppage the resistance to the power which drives it is reduced or removed, causing at once an acceleration of the speed, which reacts injuriously upon the power, and particularly when an engine or tread power is used. The table herein described will hold cornstalks of any length and has room for the operator or feeder directly at the feed-rollers and sufficient space for an assistant to deposit a reserve stock upon its surface for the feeder to draw from, and when not in use the table can be detached for

shipping or storage or swung up out of the way.

The very high speed at which a cutting-cylinder is necessarily run, together with the sudden strain from tough material and from foreign matter in all crops cut with a mowing-machine and raked with horse-rakes—stones, bones, pieces of wood, iron, &c.—renders the operation of the machine expensive from frequent breakages and dangerous from the flying particles; also, to do good work the knives must be adjusted closely to their stationary cutting-plate, as in a pair of scissors.

The style of feed-boxes heretofore used, having short bottoms and a short rigid non-reversible side board, will be found unsuited to the operation of other parts of the cutter in this case. First because only a small portion of long fodder—such as cornstalks—can be supported by the short box, the remainder being allowed to bend down and drag on the ground, making it difficult for the operator to draw it up to the feed-rollers. Again, such feed-boxes can be fed from one certain side only, no matter what the attending disadvantages may be, and, further, only one feeder or attendant can be utilized. He must necessarily feed the machine in an uneven lumpy manner, greatly reducing its capacity and increasing the strain, for the reason that he cannot obtain a steady supply of material to feed from. The feeding-table in this case represents novel features, and is especially adapted to the cutting of long fodder—such as cornstalks—cured or for ensilage, being made very long for this purpose. This great length necessitates that the table be made adjustable for shipping, handling, storing, and packing, otherwise the machine would be too unwieldy for handling and occupy too much room when not in use. It also requires an extra or front leg-support in addition to the machine-frame. The largely-increased use of carriers and elevators both for storing cured fodder and ensilage and adapted to run either to the right or left from the discharge end of power-cutters makes it important that the operator be enabled to feed the machine from either side of the feed-table, and at the same time be within easy reach of a lever for controlling the feed convenient to either side of the machine. Again, the arbitrary location of a cutter, either to accommodate the driving-belt or to narrow spaces with the cutter against one side of the wall or partition or to enable the feeder to stand upon the side of the cutter adjacent to that from which the material comes, makes it essential that the feeding-table, side boards, and hopper be so constructed that the operator may change his location at will to accommodate these requirements. Further, the combination of the long-detachable table with an adjustable side board makes it possible to utilize an additional operator standing upon the same side of the cutter as the feeder, and who throws the hay, straw, or other material on the front end of the detachable table, thus enabling the feeder always to stand close to the hopper, whereby he can produce an even continuous feed at all times, largely increasing the capacity of the cutter and relieving the machine from heavy strains produced by uneven lumpy feeding. It also enables the feeder to stand continuously within easy reach of the feed-controlling lever upon either side. A lever which is located and adjusted so that it can be operated from one side of the cutter only would be totally unfit for the operation of this machine. The lever in this case, however, enables the operator to feed and operate the cutter from either side under any and all conditions. In actual operations these conditions vary widely. Narrow passages and cramped positions, where one side of the cutter is against the partition or wall, absolutely compel the operator to stand upon the opposite side from the wall. It is desirable and economical to feed the cutter from the side adjacent to the material, otherwise a second person is required to throw the material over the machine and at considerable expense; but the location of the fly-wheel and driving-belt is usually so arbitrary that everything must yield to these features, and in case of accident or foreign matter no operator's life or limbs are safe who stands in direct line with a rapidly-running driving-belt, certain to slip or break in two at such times. In addition to the danger from the bursting of the fly-wheel, it will therefore be clearly seen that a lever for controlling the feed to be practical must be so located that it can be operated with equal freedom from either side of the cutter. This is an important feature in the present device. At the same time it will be noticed that it is the clutch which is thrown in and out of mesh instead of the teeth of the gear-wheel, which are liable to break, and that this clutch is located at the point where the very slowest speed of the machine is obtained.

The cylinder shown and described provides great strength by its continuous flange, each succeeding surface thereof bracing the preceding one and receiving the strain throughout the whole peripheral flange, and the means for adjusting the knives are particularly effective, as the knife can be adjusted at either end independently of the other and with great precision. Besides, only one bolt being used, room is afforded for a very large one, giving great strength to the connection of the parts, making the cylinder secure against breakage.

In a feed-cutter delivering the cut material into elevators and carriers a discharge-spout of the construction described is necessitated, for the reason that the elevator being secured at the discharge end of the machine directly at the center of the discharges, the sides of the carrier being elevated to an angle of forty-five degrees, more or less, said sides cross the mouth of the spout as heretofore constructed, so that a portion of the cut stock, instead of falling into the carrier, strikes the sides and

is discharged into the gearing underneath and upon the ground. This difficulty is avoided by the construction described, in which the corners of the spout are raised by making the sides converge, and the material is all discharged in compact form on the carrier.

I desire to distinguish the adjusting-blocks in this case from other forms of adjusting-pieces attached to knife-heads, such as are shown in the patent to Wilson, No. 30,597, which are attached to radial arms or flanges and adjustable out and in upon said arms or flanges. This piece is usually in the form of angle-iron, one of its surfaces or sides being bolted against the radial arm or flange and the other adjacent side forming an outer surface and supporting the knife. In this arrangement two bolts are required to secure the knife to the knife-head, one extending through the knife and angle-iron and the other through the angle-iron and the radial arm of the hub, and the knife is simply adjusted outward in the direction of the radial arm. With my block, however, the top and bottom surfaces are used, the knife resting upon the top and the bottom of the block upon the outer surfaces of the knife-head itself, and, as will be noticed, only one bolt is required in attaching the knife to the knife-head, as it passes through both the adjusting-block and the knife-head direct. The direction of the adjustment of the knife also is different. With my block the knife is adjusted both outward and forward in the direction of its rotation.

There are other methods of attaching knives to outer surfaces, as in Patent No. 7,472, (Daniels,) where, although a single bolt is used, there is no interposed adjusting-block, it resulting, in consequence, that when one end of the knife is adjusted forward more than the other, the shape of the knife being intended for a certain shear, the knife no longer fits the surface upon which it rests and does not rest down solidly upon the knife-head, thereby making the knife in operation very insecure, as well as preventing a correct approach of the cutting-edge to the stationary cutting-bar. It is also desired to distinguish the knives and adjusting-plates in this case as belonging to a cylinder-machine and not to a rotary wheel or disk-cutter, which has the knives secured to the arms or disk of the fly-wheel, as in the patent to J. Dick, No. 341,320. The knives in such cases are not made spiral, nor are they attached to the outer peripheral surface of the fly-wheel.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a machine having feed-rolls and a fixed feed-hopper in front of said rolls, the combination, with said feed-rolls and hopper, of a wing-board extension of said hopper, made adjustable in a horizontal plane at its outer end for expanding or contracting the approach to said hopper and feed-rolls, substantially as described.

2. A feed-cutting-machine hopper having a flaring side board, in combination with a short flaring wing-board extension of said hopper made to flare at a different angle from the flare of the side board proper of said hopper, substantially as described.

3. A cutting-machine hopper or feed-trough provided with a short flaring side-wing extension and a side board adjustable on either side of said hopper, substantially as described.

4. The combination, with the cutting-machine frame and hopper, of an adjustable side-board extension of said hopper and a removable longitudinal extension of the feed-table or flooring of said hopper, substantially as described.

5. A cutting-machine frame and hopper or feed-throat, in combination with an adjustable side-board extension of said hopper and a detachable longitudinal extension of the flooring or feed-table of said hopper, provided with a leg-support independent of said machine-frame, substantially as described.

6. The combination, in a feed-cutter, of the machine-frame and the feed box or hopper thereon, with wing-board extensions of said hopper, a detachable supplemental feed-table having an adjustable leg-support independent of the machine-frame, and a brace for said leg-support, substantially as described.

7. In a feed-cutter, the combination, with the feed-gearing, of a shifting-lever device for controlling said gearing, having its handle end extended longitudinally over the hopper of feed-box thereof in convenient position to be operated from either side of the cutter, substantially as described.

8. The combination, with the shouldered feed-roll shaft and its actuating-gear mounted loosely on the shouldered end thereof, of a sliding clutch for engaging said gear with said shaft, and a lever for moving said clutch, pivoted to extend over the machine between the lines of the side plates thereof in position to be operated from either side of the machine, substantially as described.

9. The combination, in a feed-cutter, with the feed-gearing thereof, of a shifting-lever for controlling said gearing, having its handle end extended over the hopper or feed-table and pivoted in position to allow the handle to move transversely of the cutter, substantially as described.

10. The yielding feed-roll and a gear therefor, in combination with an automatic vibrating gear held in mesh therewith, the non-yielding feed-roll and its gear, and a suitably-mounted intermediate gear in mesh with said non-yielding roller gear and with said vibrating gear, said latter gear being arranged to travel simultaneously with the yielding roller gear, one following the other to and fro approximately in the same track or course of travel, substantially as described.

11. The gear *e* on the fixed feed-roll shaft, in combination and in mesh with a double or barrel gear *e'*, and a gear e^2, vibrating to and fro at the side of the gear *e* and in mesh with the gear *e'* and with the vibrating gear e^3 on the yielding feed-roll shaft, substantially as described.

12. In expansion-gearing for feed-rolls, the non-yielding and yielding feed-roll gears located one outside the plane of the other, in combination with a double or wide-face pinion in mesh with said non-yielding feed-roll gear and an automatic vibrating gear in mesh with the double pinion and in the same plane as the yielding feed-roll gear and in mesh therewith, the vibratile gear being adapted to vibrate to and fro outside the plane of the inner feed-roll gear and partially around the double gear as a center, substantially as described.

13. The combination, in a feed mechanism for feed-cutters, of a yielding feed-roll shaft, two gears meshing one with the other, one of which has its teeth rounded or curved across its face, and a bearing-box pivoted centrally inside of said gear for permitting the vibration of said shaft, substantially as described.

14. In a feed-cutter, a yielding shaft, in combination with two gears, one of which is secured to said shaft, and a strap or hanger connecting said gears and provided on one end with a pivotal bearing extended inside of the gear on the yielding shaft, permitting said gear to vibrate its teeth in the teeth of the intermeshing gear as said shaft is vibrated, substantially as described.

15. The combination, in a feed-cutter, of a yielding feed-roll shaft, two intermeshing vibrating gears e^2 and e^3 following each other in approximately the same general direction or course and located one above the other, the gear e^3 upon the yielding shaft and moving therewith, and the gear *e'*, relative to which as a center the gear e^2 vibrates, substantially as described.

16. The combination, in a feed-cutter, of a yielding feed-roll shaft, a driving-gear therefor fast on said shaft, and a yielding bearing for said shaft arranged centrally of and vibrating with said gear on supporting-trunnions located in the same vertical plane with said gear, substantially as and for the purpose described.

17. The combination, with the yielding feed-roll shaft of a feed-cutter, of a pivoted bearing for said shaft, and a yielding support adapted to receive and retain said bearing and permit it to rock, substantially as and for the purpose described.

18. In a feed-cutter, a feed-roll having longitudinally-extending flutes or ribs, in combination with an opposing roll having teeth on its periphery in circular rows, and a stationary comb having teeth which project between the rows of teeth on said toothed roller, substantially as described.

19. A cutter-cylinder head having a slotted outer peripheral surface, in combination with a knife, an interposed knife block or plate thereon, and a bolt for securing said knife and block to said surface, substantially as described.

20. A cutter-cylinder head having a slotted outer peripheral surface, in combination with a knife and an adjustable knife-block interposed between said knife and head, and a radially-arranged through-bolt for securing said knife and block to said surface, substantially as described.

21. In a knife-cylinder, cylinder-heads having outer peripheral surfaces or seats, in combination with the cutting-knives and interposed knife-adjusting blocks or saddles adapted to rest on said outer peripheral seats and provided with ribs or corrugations for adjusting said cutter-knives, and a bolt for securing said knife and adjusting-block to said cylinder-head seats, substantially as described.

22. A cutting-cylinder knife-head having an outer or peripheral flange or rim, in combination with a knife secured thereto, a block or plate interposed between said knife and flanged head, and a through-bolt for securing said block and knife to said head, substantially as described.

23. The combination, with the peripheral flange on the cylinder-head having one or more segmental depressions, as described, of the knives secured thereto, the interposed blocks, and the through-bolt for securing said knives and blocks to said head, substantially as described.

24. A knife-cylinder head having an outer or peripheral surface provided with slots, in combination with a knife secured to said head and an interposed adjusting block or plate between said outer surface and knife, said block being provided with a heel projection for the knife to rest against, and a through-bolt for securing said knife and block to said head, 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.