4 Sheets—Sheet 1.

R. EICKEMEYER.

Mower.

No. 201,396. **Patented March 19, 1878.**

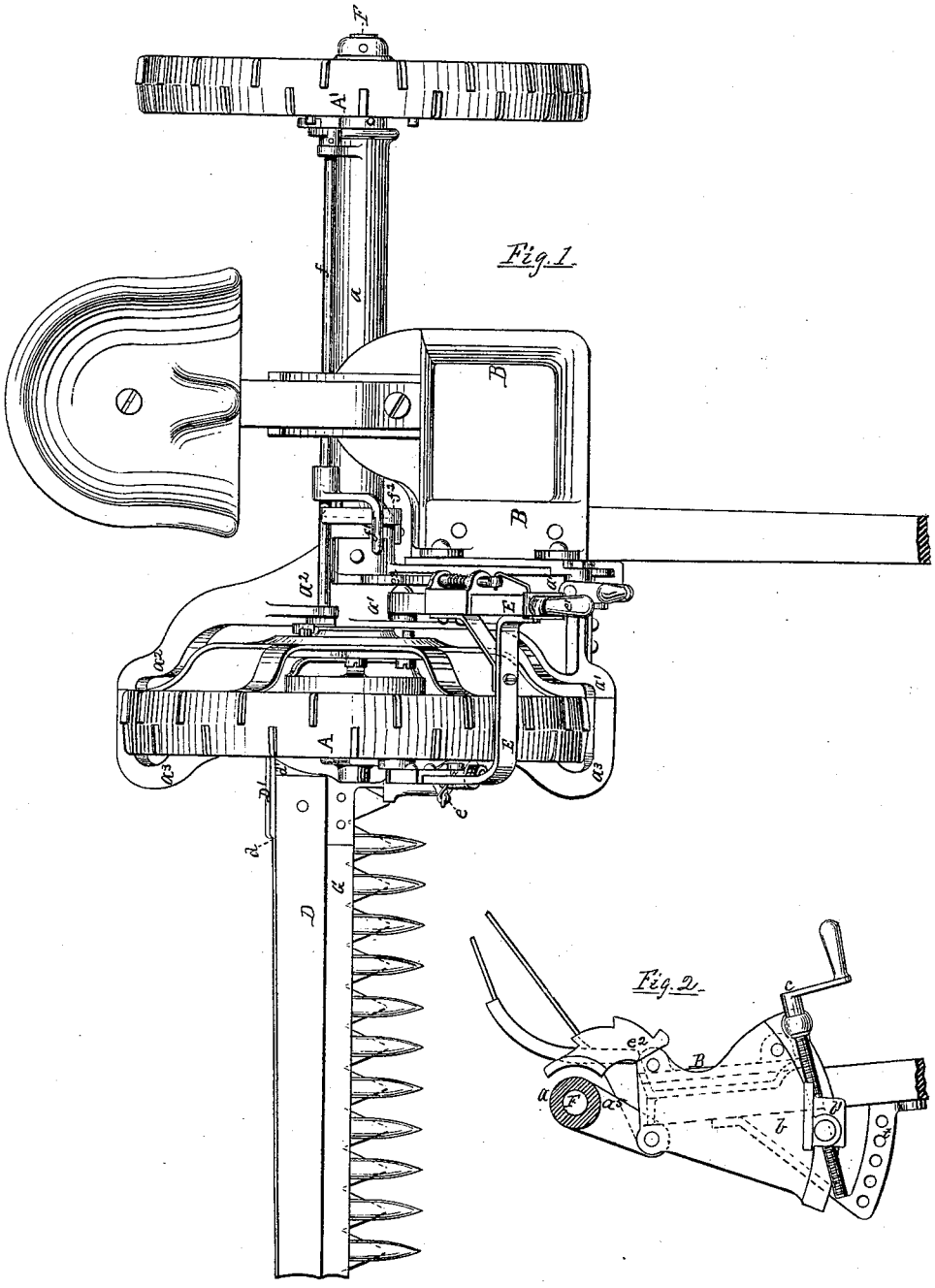

Fig. 1.

Fig. 2.

Attest:
Philip F. Larner
A. B. Cauldwell

Inventor:
Rudolf Eickemeyer
By Munn & Co
Attorneys

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

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Mower.

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Fig. 3

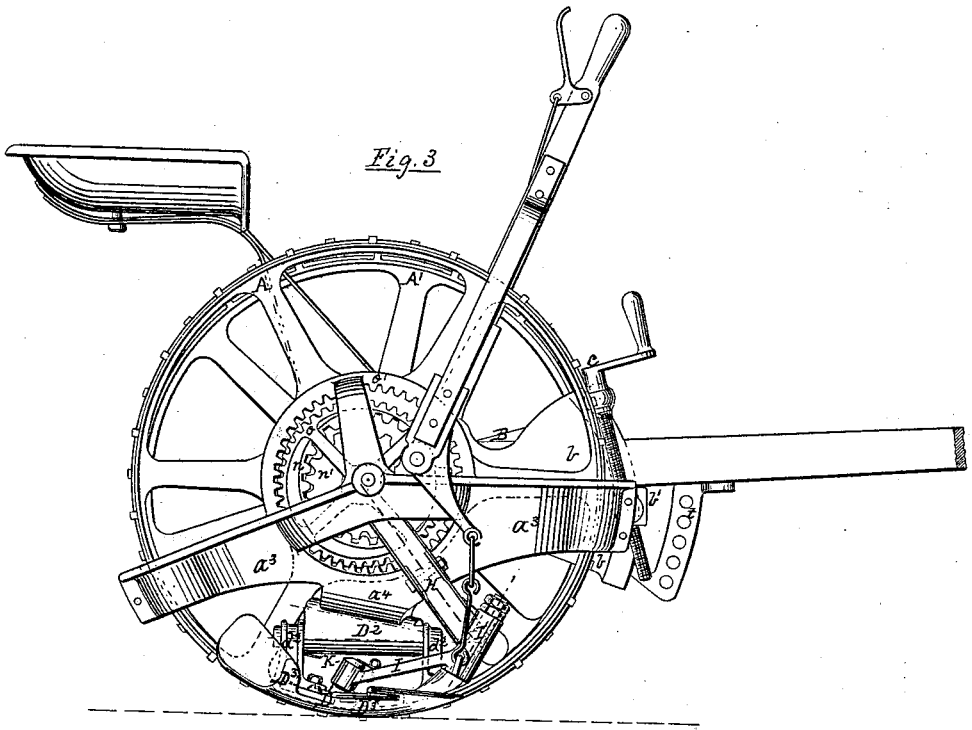

Fig. 4.

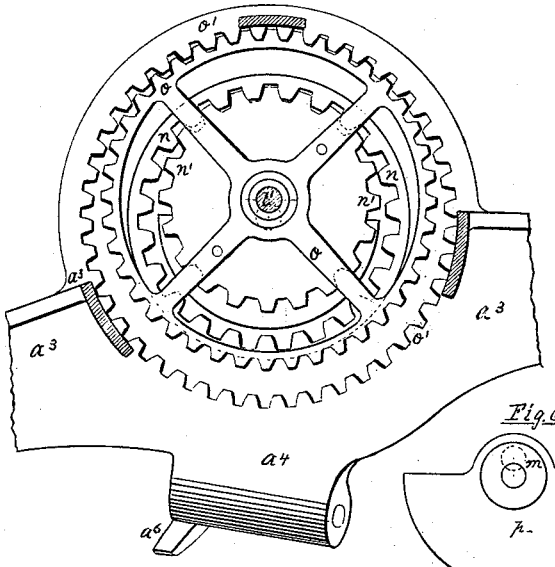

Fig. 5.

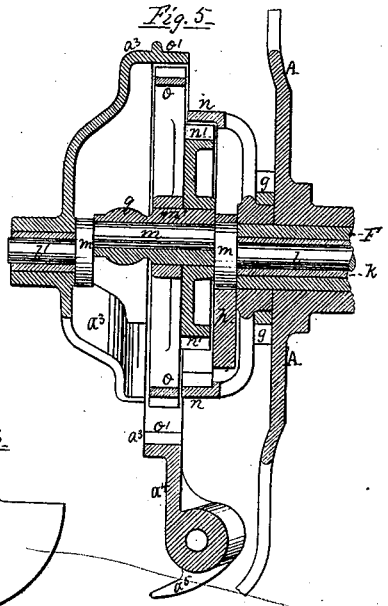

Fig. 6.

Attest:
Philip F. Garner
A. B. Caldwell

Inventor
Rudolf Eickemeyer
By Munn & Co
Attorney

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

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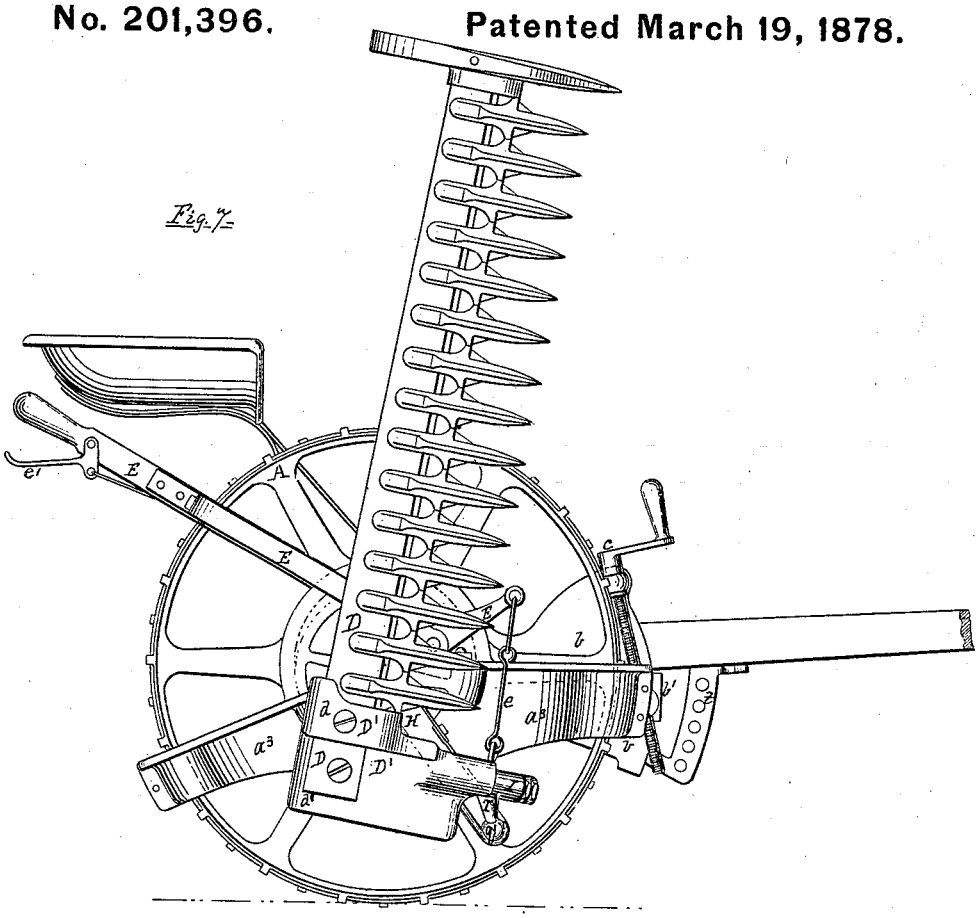
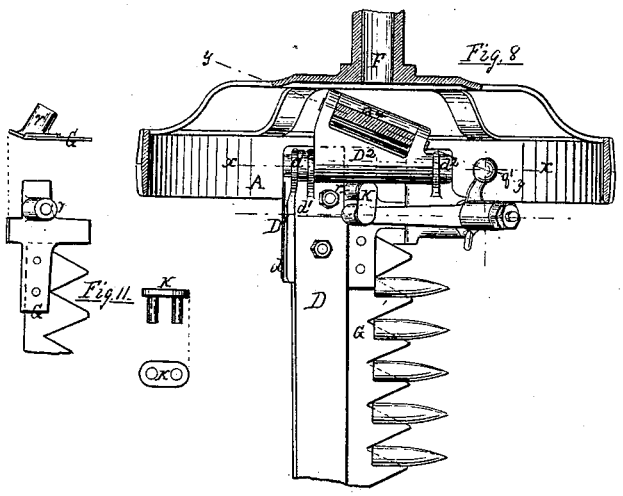
R. EICKEMEYER.

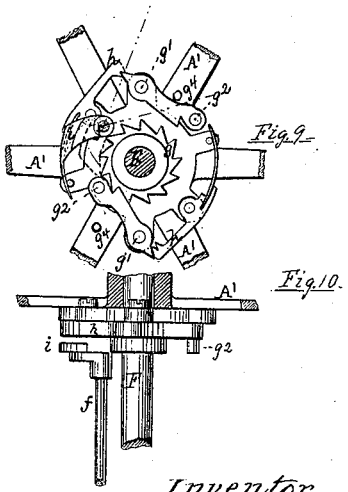
Mower.

No. 201,396. **Patented March 19, 1878.**

Fig. 7.







Attest:
Philip F. Larner
A. B. Cauldwell

Inventor
Rudolf Eickemeyer
By Munn & Co
Attorneys.

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

4 Sheets—Sheet 4.

R. EICKEMEYER.

Mower.

No. 201,396. **Patented March 19, 1878.**

Fig. 12

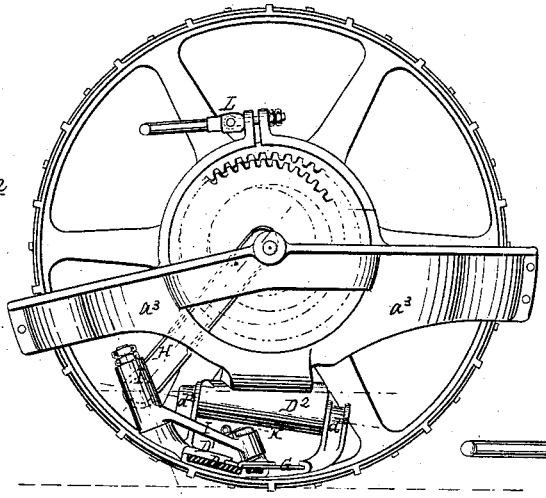


Fig. 13

Fig. 14

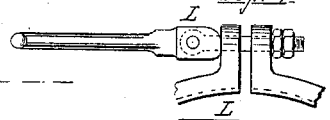


Fig. 15

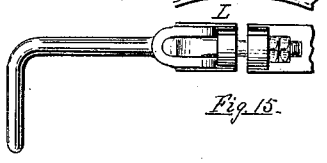


Fig. 16

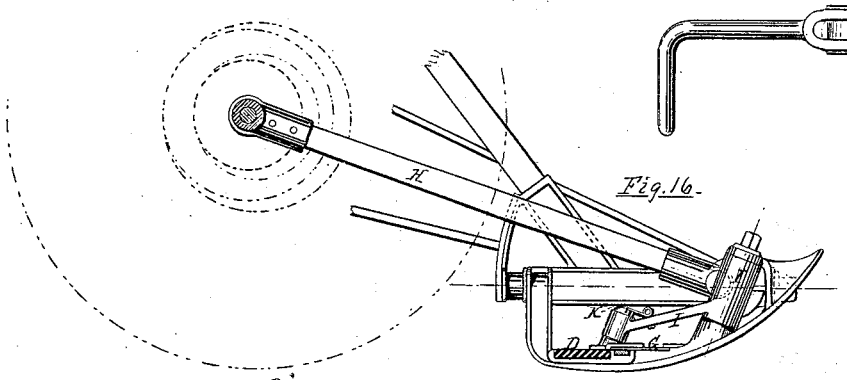
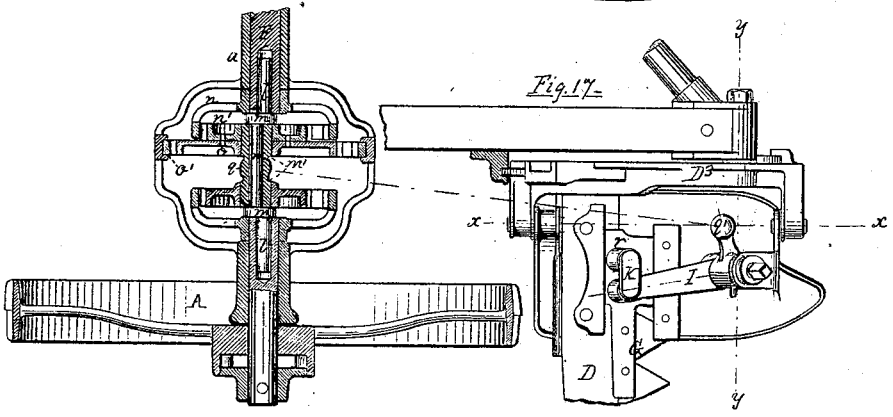


Fig. 17



Attest.
Philip F. Larner
A. B. Caldwell

Inventor:
Rudolf Eickemeyer
By Wm. C. Wood
Attorney

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

RUDOLF EICKEMEYER, OF YONKERS, NEW YORK.

IMPROVEMENT IN MOWERS.

Specification forming part of Letters Patent No. **201,396,** dated March 19, 1878; application filed June 23, 1877.

To all whom it may concern:

Be it known that I, RUDOLF EICKEMEYER, of the city of Yonkers, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Mowing-Machines; and I do hereby declare that the following specification, taken in connection with the drawings furnished and forming a part of the same, is a clear, true, and complete description thereof.

The prime object of my invention is to attain a strong, durable, light-running machine, which can be easily handled in operation, and be capable of performing the various kinds of service to which mowing and harvesting machines are applicable.

My invention consists, partially, in the combination, with the drive-wheel and axle of a mowing-machine or reaper, of an internal gear mounted on the axle, a stationary internal geared ring, a crank with its axes or crank-pins coincident with the axle, a pitman which connects said crank with the cutting apparatus, and two gears mounted on said crank, which mesh, respectively, with the movable and stationary internal gears, whereby said crank is driven in a rapid, reliable, and easy manner, for affording the requisite longitudinal movement to the pitman which operates the cutter-bar.

For lessening the friction between pitman and crank, my invention further consists in providing the wrist-pin of the crank with a bushing, with which the pitman connects, and on which the two crank-gears are mounted. For balancing these gears on the crank, the latter is provided with a balance-weight.

For obviating the friction of an inner shoe on the ground, and protecting the hinge-joints, the pitman, and its connection with the cutters, my invention further consists in combining, with one of the drive-wheels and a portion of the frame located within the rim of the wheel, a finger-bar, the head of which is hinged to the frame within the wheel and adjacent to the ground, within the rim. With this construction I am enabled also to locate the inner end of the cutter-bar closely adjacent to the rim of the wheel, and thereby reduce the distance between the cutters and driving-gear to a minimum.

For securing an easy movement of the cutter-bar and a smooth and reliable transmission thereto of power from the gearing, my invention further consists in the combination, with the finger-bar, of a rectangular hinge and an oblique-angled hinge, by which the bar is attached to the frame, and a bell-crank lever for operating the cutters, which has its pitman-bearing located at the intersection of the axial lines of both hinge-joints; and, further, in this connection, my invention consists in the combination of a bell-crank lever, mounted on an inclined stud on the inner shoe or finger-bar head, with the cutter-bar and a link for connecting them, which has pin-joints parallel with the inclined stud.

For elevating in an easy and reliable manner the cutting apparatus from a horizontal to an inclined or perpendicular position, and there securely holding it, my invention further consists in the combination, with a finger-bar which is hinged to the frame within the wheel by a rectangular joint and an oblique-angled joint, of a lifting-lever provided with bolt and catch, and connected with the finger-bar head at its outer side opposite the point at which the axial lines of both hinge-joints intersect.

For the purpose of locating the cutting apparatus close to the ground, and having it at the same time so that its inner end in cross-section will conform practically to the interior surface of the rim of the drive-wheel, my invention further consists in the combination, with a drive-wheel which performs the function of an inner shoe, of a finger-bar which has its inner end located within the rim of the drive-wheel, and which inclines downward from its rear to its front edge, in combination with a cutter-bar and cutters which occupy a plane angular to the finger-bar.

For maintaining the cutting apparatus longitudinally parallel with the surface of the ground at various heights of cut, my invention further consists in the combination, with a finger-bar which is hinged to the frame within the rim of a drive-wheel, and is adjusted in an arc concentric with said wheel, of an outer shoe having an outline or bearing-surface which corresponds with the outer periphery of the drive-wheel.

For uniting the finger-bar with its inner head or shoe, so that it will occupy a position closely adjacent to the interior surface of the drive-wheel rim, and at the same time be strongly connected to said head, my invention further consists in the combination, with the finger-bar, of a solid inner head or shoe, recessed to receive the end of the bar beneath the inner portion and above the outer portion of the head.

For operatively connecting the drive-wheels and axle or main shaft and conveniently controlling the cutting apparatus and gearing, my invention further consists in the novel combination, with ratchet-wheel and pawls, of spring-pawl holders and a pawl-lifter provided with a rod and lever, whereby the pawls are permitted to engage with the ratchet, or permitted to be held therefrom by their holders at the will of the driver.

For conveniently adjusting the height of cut and maintaining it at any desired adjustment, my invention further consists in the combination, with the main frame, the pole-frame, and a cutting apparatus which is supported by the main frame, and is adjustable with relation to the ground by its backward or forward movement within the circumferential plane of the drive-wheel, of an adjusting-screw which rigidly connects the pole-frame and main frame, and serves to change the position of the main frame on the axle for adjusting the cutters with relation to the ground. The cutting apparatus in this combination is not lifted bodily, as heretofore, but is moved forward or backward for a high or low cut respectively, and this movement is in the arc of a circle of which the axle of the machine is the center.

For relieving the team from the downward pressure of the pole during heavy service, I employ (as has heretofore been done in wheel-plows) a rigid perforated bar suspended from the pole at its rear end, which is of effective value, in view of the fact that the pole-frame and main frame are rigidly connected by the screw by which the cutting apparatus is adjusted with relation to the surface of the ground.

A suspended vibratory draft-bar has heretofore been employed attached to the pole, and connected by a link with the cutter-frame, for varying the upward draft of the cutter-bar; but such a device cannot be profitably employed in combination with a main frame and a pole-frame hinged thereto and inflexibly connected by adjusting devices.

To more particularly describe my invention, I will refer to the accompanying four sheets of drawings, in which—

Figure 1, Sheet 1, represents, in top view, one of my machines. Fig. 2, Sheet 1, represents, in side view, on an enlarged scale, the adjusting-screw and the adjacent parts, whereby the position of the main frame with relation to the pole-frame is regulated and the height of cut adjusted. Fig. 3, Sheet 2, represents, in side elevation, the machine shown in Fig. 1 with its cutting apparatus in position for service. Fig. 4, Sheet 2, represents, in side view, on an enlarged scale, a portion of the main frame and the gearing of the machine. Fig. 5, Sheet 2, represents, in central vertical cross-section, the gearing shown in Fig. 4. Fig. 6, Sheet 2, represents, in side view, a balance-weight hereinafter described. Fig. 7, Sheet 3, represents, in side view, my machine with its cutting apparatus elevated. Fig. 8, Sheet 3, represents, partially in plan and partially in section, portions of the drive-wheel, main frame, cutting apparatus, and the joints by which it is hinged to the frame. Figs. 9 and 10, Sheet 3, represent, on an enlarged scale, in side and top view, respectively, a portion of one of the drive-wheels, its ratchets, pawls, holders, and lifter. Fig. 11, Sheet 3, represents in detail the inner end of the cutter-bar, a socket thereon, and a link by which the cutter-bar is connected with a bell-crank lever. Figs. 12 to 17, inclusive, Sheet 4, represent certain modifications of my im-chine hereinafter fully described.

A and A′ denote the driving-wheels of the machine. The main frame of the machine embraces a tubular section, *a*, within which the axle is located; also a rectangular portion, a^1, which projects forward from the tubular section at one end, and a similar portion, a^2, which oppositely projects rearward and slightly downward.

A curved side piece, a^3, is bolted to the parts a^1 and a^2 at the side of each, at its outer end, in such a manner that an intervening space is afforded, in which the adjacent driving-wheel A is located.

The pole is attached to a platform or pole-frame, B, which is at its rear end hinged to a rod supported by the portion a^1, and by a bracket, a^5, which projects from the front side of the tubular section *a* of the frame, as shown in Fig. 2.

The driver's seat is mounted on the platform at the rear of the hinge-rod.

Secured to the side of the pole-platform B is a vertical segmental guide-plate, *b*, which at its outer edge occupies a vertical slot in a bracket, *b′*, attached to the adjacent portion of the frame a^1.

At the front upper corner of the plate *b* is a crank-screw, *c*, which is embraced in a swivel-bolt secured to the plate, and is housed below in a cylindrical nut within the bracket *b′*, as illustrated in Fig. 2.

With this construction it will be seen that the entire frame of the machine may be moved on the axle and adjusted with relation to the pole for regulating the height of cut, as will be hereinafter described.

The driving-wheel A has inwardly-dished spokes, which afford a central space within for the driving-gear, a portion of which is cast solidly with the side piece a^3, which latter is also provided with a down-hanger at a^4, to which the finger-bar is hinged. The finger-

bar is shown at D. At its inner end is a head, D^1, to which the bar is attached in a novel manner.

The head D^1 is recessed, so that the finger-bar, when longitudinally entered therein, lies in the recess above the outer portion of the head at d and beneath the inner portion at d^1, and is secured in position by two bolts, as shown in Fig. 8, Sheet 3. With this construction it will be seen that neither bolt is unduly strained during the upward and downward movement of the finger-bar, and that the recesses afford good bearings against lateral strain on the finger-bar.

In machines having an inner shoe or a wheel to perform the same function, the finger-bar and the knife-bar are in the same plane; but in my machine they occupy different planes, in order that the finger-bar and cutters may be as near the ground as possible, and be elevated above the inner surface of the driving-wheel rim.

In Fig. 3, Sheet 2, it will be seen that the finger-bar D in cross-section inclines downward in front, that the fingers are attached thereto, so that the knife-bar G and cutters in cross-section occupy a different plane, the finger-bar and cutters being so arranged with relation to each other as to practically conform to the rim of the wheel, and to locate the cutter-bar as nearly as possible to the ground.

The head D^1, so far as relates to its connection with the finger-bar, corresponds with the ordinary inner shoe, and therefore the method shown of uniting the finger-bar with the head is applicable as well to an inner shoe. The head D^1 has a front and a rear standard, as at d^2, which afford bearings for a hinge-pin which is at right angles to the finger-bar and elevated therefrom. The finger-bar head is hinged to the down-hanger a^4 of the side piece a^3 by means of a peculiarly-formed hinge-piece, D^2, (shown in Fig. 8, Sheet 3,) which is mounted on the hinge-pin between standards d^2, and has a second hinge-pin at an angle thereto, by which it is connected to the down-hanger a^4, which is drilled to receive it, as indicated in Fig. 4. From the under side of the hanger a^4, near its rear end, is a laterally-projecting stud at a^6, which supports the hinge-piece D^1, as shown in Fig. 4, and prevents the finger-bar head from resting upon the interior of the rim of the wheel A.

With this construction it will be seen that the finger-bar may be moved freely upward against the wheel on the rectangular hinge-joint, and that it is free to rock as if on a longitudinal axis upon the oblique-angled joint. The outer end of the finger-bar is provided with a shoe, D^3, Fig. 3, which conforms in its outline with the periphery of the wheel A, and the finger-bar is so attached to the frame that the point of contact of the outer shoe with the ground will coincide or be in line with the axle of the machine, and the finger-bar therefore will always be parallel with the ground regardless of the height of cut to which the machine may be adjusted by means of its adjusting-screw c.

The lifting-lever is shown at E. It is bifurcated in form, and each of its legs has a fulcrum or pivot, one on the side piece a^3 and the other on the front projection a^1 of the frame, the wheel A being between the legs of the lever. The outer leg, which is inclined forward below its pivot, is attached, by a chain or links, e, to the finger-bar head at its outer side. The inner leg is provided with a spring-bolt and a latch-lever, e^1, whereby said bolt is disengaged from a segmental ratchet-plate, e^2, secured at the base of the lever to the tubular portion of the frame a. The lifting-lever link is connected with the finger-bar head at a point which is in line with the point of intersection of the lines of the axes of the two hinge-joints, so that there is no change of position at the point of connection resulting from the rise and fall of the inner end of the finger-bar.

With the lifting-lever thus connected the finger-bar is first moved on the rectangular joint, and when partially raised moves on the oblique-angled joint, and completes its movement on the rectangular joint until the finger-bar occupies a vertical position. The axle or driving-shaft F has the wheels A and A′ loosely mounted thereon, but operatively connected therewith by ratchet and pawls, which are controlled in a novel manner.

Parallel with the tubular section a of the frame is a pawl, rod, or shaft, f, provided with a lever, f^1, accessible to foot or hand, and adjacent to the driver's seat. It is maintained in position by a bent spring, f^2.

Figs. 9 and 10, Sheet 3, are enlarged views of the axle F and a portion of the driving-wheel A′. The ratchet-wheel g is, as usual, secured to the axle. Each of the two pawls is pivoted, as at g^1, to the wheel, and at the opposite end each has a laterally-projecting pin, g^2. The pivoted end of each pawl is beveled on each side, so that an edge is formed for entering a V-shaped recess in the pawl-keeper h, which is centrally pivoted, and provided with a spring which forces the recessed end toward the pawl.

The outer end of the keeper, the sides of the recess therein, and the faces of the adjacent end of the pawl are so formed that pressure applied to the pin g^2 will cause the pawl to engage or be disengaged from the keeper. Projecting pins, as at g^4, in adjacent spokes of the wheel limit the movement of the pawls.

Each set of pawls is controlled by a pawl-lifter, i, on the end of pawl-rod f, and in Fig. 9 one pawl is shown to be engaged with the ratchet-wheel and the other disengaged therefrom and held by its keeper h. The lifter i is shown in one position in solid lines, and also in another position in dotted lines. When the lever f^1 is pressed downward the outer end of lifter i is thrown outward, its inner edge engages with the pins g^2 of the pawls, when held by their keepers, releases the pawls there-

from, and permits them to engage with the ratchet; and to lift them from said ratchet, the lever f^1 is raised, throwing the lifter i inward, which causes its outer edge to engage with pins g^2, thereby lifting the pawls from the ratchet and forcing them into the custody of their respective keepers. The springs of the keepers cause them to so press against the outer ends of the pawls as to cause them to properly engage with their ratchet. The other driving-wheel, A, is similarly provided with ratchet, pawls, and keepers; but these are on the outer side of the wheel, the pins g^2 on the pawls projecting inward through slots in the wheel within control of another lifter, i, which is thereat provided.

The driving-gear is of a type not in common use, but which has heretofore been proposed for transmitting rotary motion at increased or decreased velocities. So far as my knowledge extends, it has never before been adapted to mowing-machines for converting rotary into reciprocating motion. It is best illustrated in Figs. 4, 5, and 6, Sheet 2. The end of the main shaft or axle F, on which the wheel A is mounted, is enlarged in diameter for a short distance from its end, and is bored out centrally for the reception of a bushing, k, within which is a bearing for the axis l of crank m, which is at its outer end provided with a similar axis, l', which has a coincident bearing in the side piece a^3 of the frame of the machine. An internal gear, n, having in this instance twenty-three teeth, is keyed to the outer end of the axle F, with the ratchet-wheel g intervening between it and the driving-wheel. The crank m has its pin inclosed within a cylindrical bush, m', either made solidly or in two half-sections. Within the internal gear n, and loosely mounted on the crank-bush, is a smaller gear, n', having in this instance twenty teeth, which mesh with the internal gear, the difference in the diameters of these gears at the pitch-line being equal to the throw of the crank m. Alongside of the gear n' is a larger gear, o, having in this instance forty teeth. These two gears may be cast as one, as both are connected and firmly mounted on the crank-bushing and move together. The gear o is located within and meshes with a larger internal stationary gear, o', having in this instance forty-four teeth. This stationary gear or toothed annulus is cast solidly with the side piece a^3 of the frame. The difference between the diameters of gears o and o' is, as with the others, equal to the throw of the crank. With this construction it will be seen that, as the machine advances, the main shaft will cause both gears n' and o to travel in the path of the crank by their meshing with the rotating and the stationary internal gears, and it is by these means that I attain the crank-motion requisite for operating the cutter-bar.

In certain prior Letters Patent granted to me I show and describe mowing-machine gearing composed of two gears, one of which is mounted on a crank and actuated by the second gear. I attain, by the present arrangement of gearing, a greater throw of the crank with a smooth and easy action. For balancing the crank, it is provided with a counterweight, as at p, which is semicircular in form, and is shown in Figs. 5 and 6, Sheet 2.

The gearing, as described, imparts to the crank twenty-three revolutions to every revolution of the gear n, and, as the gear n is connected with gear o, this latter is made to roll in the gear o' at the same speed, its periphery making twenty-three complete movements over the teeth of the stationary gear to every two revolutions on its own axis, the bushing revolving with the gears mounted on it.

The connection of the gearing with the cutter or knife bar G is effected by means of the pitman H, Fig. 3, bell-crank lever I, and link K. (Shown in Fig. 11.) The link K has two pins, and is kept in place by a spring, as shown in Fig. 3. The pitman H is provided with a ball-socket at its upper end, which embraces the bushing on crank m at a ball-bearing thereon, as shown at q, Fig. 5. At its lower end it has another ball-socket for engaging with a ball, q', on the lever I. (Shown in Fig. 8.) The pitman H may be constructed partially of wood, hollowed at the ends, and provided with metallic straps for the ball-sockets, secured by bolts, as indicated in Fig. 3; or it may be constructed wholly of metal.

The bell-crank lever I is of peculiar form. It has an inclined sleeve for receiving an inclined fulcrum-pin, this latter being mounted in the front end of the finger-bar head D'. The fulcrum-pin has a jam-nut, by which the lever is held in position and the wear of the ends of its sleeve taken up from time to time. This pin is inclined, as shown, in order that the movement of the short arm of the bell-crank lever shall be as nearly as possible in line with the longitudinal movement of the pitman.

The lower or long arm of lever I has an inclined bearing for receiving one of the two pivots of link K, the other pivot occupying a similarly-inclined socket, r, on the cutter-bar G, and these pins or pivots on the link constitute, with their sockets, pin-joints, which are parallel with the inclined stud, which secures a smooth and easy movement of the cutters.

While it is obvious that the pitman may be connected directly to crank m, and thereby transmit motion from the gears to the cutter-bar, I prefer the bushing-connection, because the slow rotation of the bushing induces less friction at the pitman ball-joint than would be the case if the pitman were connected directly with the crank. Moreover, in this latter case, the wrist-pin of the crank would serve as a direct connection for transmitting power from the gearing, and I prefer that it should, as shown, serve mainly as a means or guide for keeping the gears in proper relation

with each other, and the balance-weight on the crank assists it by balancing the gears on the bushing.

It is important for securing an easy movement of the cutters, regardless of the elevation or depression of the outer shoe, that the axes of the hinge-joints should be in line with the ball on the bell-crank lever; and in Fig. 8 it will be seen that the line *x x* through the rectangular hinge-joint intersects with the line *y y* through the obliquely-hinged joint at or about the center of the ball on bell-crank I, and these parts maintain at all times substantially the same positions with relation to each other, regardless of the elevation or depression of the outer end of the finger-bar and cutters.

The main frame and pole-frame being inflexibly connected by the adjusting-screw, I attach to the rear end of the pole a perforated hanger, as at *t*, to which the evener-bar is attached at the highest or at a lower point, according to whether the work to be performed is light or heavy, and thereby relieve the horses from the downward pressure of the pole.

I employ, substantially as heretofore, certain means for correcting, to some degree, the tendency to side draft. The outer wheel A′ is a little less in diameter than the inner wheel A. Both wheels being separately connected by ratchet and pawl with the axle, it is obvious, if the outer wheel makes a revolution quicker than the inner wheel, that the axle will be rotated in advance of the inner wheel, and therefore this inner wheel will not contribute to the performance of work so long as the friction of the outer wheel with the ground is sufficient to perform it, and that during that condition of affairs there will be no undue side draft. If, however, the work be greater than the outer wheel can alone perform, it will slightly drag on the ground, the axle will move slower, and thereupon the inner wheel will proceed to contribute to the labor, and will perform only so much as will permit the outer wheel to revolve, slipping meantime sufficiently to balance the side draft.

The mode of operating my machine will be obvious from the detailed description already given.

I will next describe a few modifications of my invention which are shown on Sheet 4 of the drawings.

In Fig. 12 I show the hinge-joint reversed, which permits a somewhat freer upward movement of the fingers than when constructed as previously described. This change involves the necessity of mounting the bell-crank lever I on the rear end of the finger-bar head D′, and the pitman H is therefore inclined rearward instead of forward. I also show a different means for stopping and starting the cutting mechanism. Instead of having the toothed annulus a part of the frame, as before described, I here show an internal geared ring, which is embraced within a sectional annulus provided with ears, a bolt, and a cam-lever, as at L, by means of which the geared ring may be permitted to revolve in its peripherical bearing when the cutters are to be inactive; or it may be held in a fixed position when the cutters are to operate.

Figs. 13, 14, and 15 illustrate the lever L, and also its adjacent parts, in enlarged detail.

To show in what manner this system of gearing described may be applied to front-side-cut machines, I have illustrated the same so applied in Figs. 16 and 17.

The main frame is extended forward and downward to the required position. The inner shoe is hinged to the intermediate hinge-piece D^3 on line *x x* at right angles to the finger-bar, and said hinge-piece is hinged to the frame on line *y y* parallel with the finger-bar, and the point at which these two lines cross each other is occupied by the ball on the short arm of the bell-crank when in its central position. The usual lever and ratchet may be applied to the hinge-piece D^3 for regulating the height of cut.

The gearing in Fig. 17 embraces substantially the features previously described, but includes two additional gears. With this construction, the axle is in two parts, each being operatively connected with its respective drive-wheel by the usual pawl and ratchets, and each affording a bearing for the crank. A gear is attached to each end of the bushing of the crank, and each is surrounded by an internal gear secured to its respective portion of the axle, and thence with a drive-wheel. Both drive-wheels thus engage equally with the bush-gears on the crank.

As before described, there is a larger gear which meshes with an internal geared ring embraced within a sectional annulus, and controlled by a lever, as described in connection with Figs. 12, 13, 14, and 15.

In Fig. 17 the construction is such that the entire gearing may be incased in a chambered portion of the frame, requiring only an open space for the introduction of the sectional annulus or compressing-ring and an opening for the pitman.

It is obvious that my improvements may be applied, in whole or in part, to machines for reaping, as well as for mowing, and to machines of the several classifications known, whether one-wheel or two-wheel, and without regard to the location of the cutting apparatus with relation to the main frame and main driving-wheel; and I do not therefore limit my invention to the particular classes of mowing-machines herein shown and described.

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

1. In a mowing-machine, the combination, with the drive-wheel and axle, of an internal gear mounted on the axle, a stationary internal geared ring, a crank with its axis coincident with the axle, two gears mounted on said

crank, which mesh with the movable and the stationary internal gears, and a pitman which connects the crank with the cutting apparatus, substantially as described.

2. The combination, with the stationary and the driven internal gears, of the crank, the two gears, and the bushing on the wrist-pin of the crank, substantially as described.

3. The combination, with the crank and its rotative gearing, of the balance-weight, substantially as described.

4. The combination, with the drive-wheel and a portion of the main frame which occupies the space inclosed by the rim of the wheel, of a finger-bar which is hinged to the frame within the wheel adjacent to its rim, substantially as described, whereby the driving-wheel operates as an inner shoe, and its rim serves to protect the hinge-joints, the pitman, and its connection with the cutters, as set forth.

5. The combination, with the finger-bar, of a rectangular hinge and an oblique-angled hinge by which the finger-bar is attached to the frame, and a bell-crank lever for operating the knife-bar, which has its pitman-bearing located at the intersection of the axial lines of both hinge-joints, substantially as described, for the purposes specified.

6. The bell-crank lever, mounted on an inclined stud on the inner shoe or finger-bar head, in combination with the cutter bar and a link connected with the cutter-bar and lever by pin-joints, which are parallel with the inclined stud, substantially as described.

7. The combination, with the double hinged finger-bar, supported by the frame of the machine within the drive-wheel, and having its inner end located within the rim of the drive-wheel, so that the latter operates as an inner shoe, of a lifting-lever for raising the finger-bar and cutters to a perpendicular position, and means for holding it in that position, substantially as described.

8. The combination, with a finger-bar which is hinged to the frame, with a rectangular joint and an oblique-angled joint, of a lifting-lever provided with bolt and catch, and connected with the finger-bar head at its outer side opposite the point at which the axial lines of both joints intersect, as and for the purposes specified.

9. The combination, with a drive-wheel which performs the function of an inner shoe, of a finger-bar which is hinged within the rim of the drive-wheel and inclines downward from its rear edge, and a cutter-bar which occupies a plane angularly upward and forward from the finger-bar, as and for the purposes specified.

10. The combination, with a drive-wheel which performs the function of an inner shoe, of a finger-bar which is hinged within the rim of the drive-wheel, and is adjusted in an arc concentric with said wheel, and an outer shoe which has an outline or bearing-surface corresponding with the periphery of the drive-wheel, as set forth.

11. A solid finger-bar head or inner shoe, recessed to receive the end of the finger-bar beneath the inner portion and above the outer portion of the head, substantially as described.

12. The combination, with the ratchet-wheel and pawls, of the spring-pawl holders and the pawl-lifter, its rod, and lever, substantially as described.

13. The combination, with the main frame, a pole-frame, and an adjusting-screw for changing the relative positions of the two frames, of a cutting apparatus which is attached to the main frame, and is rendered adjustable with reference to the height of cut by a forward or backward movement within the circumferential plane of the drive-wheel, due to the tilting of the main frame on the axle, substantially as described.

RUDOLF EICKEMEYER.

Witnesses:
G. OSTERHELD,
GEORGE NARR.