(No Model.) 5 Sheets—Sheet 1.

R. DUTTON.

MACHINE FOR GRINDING MOWER KNIVES.

No. 457,079. Patented Aug. 4, 1891.

Fig. 1.

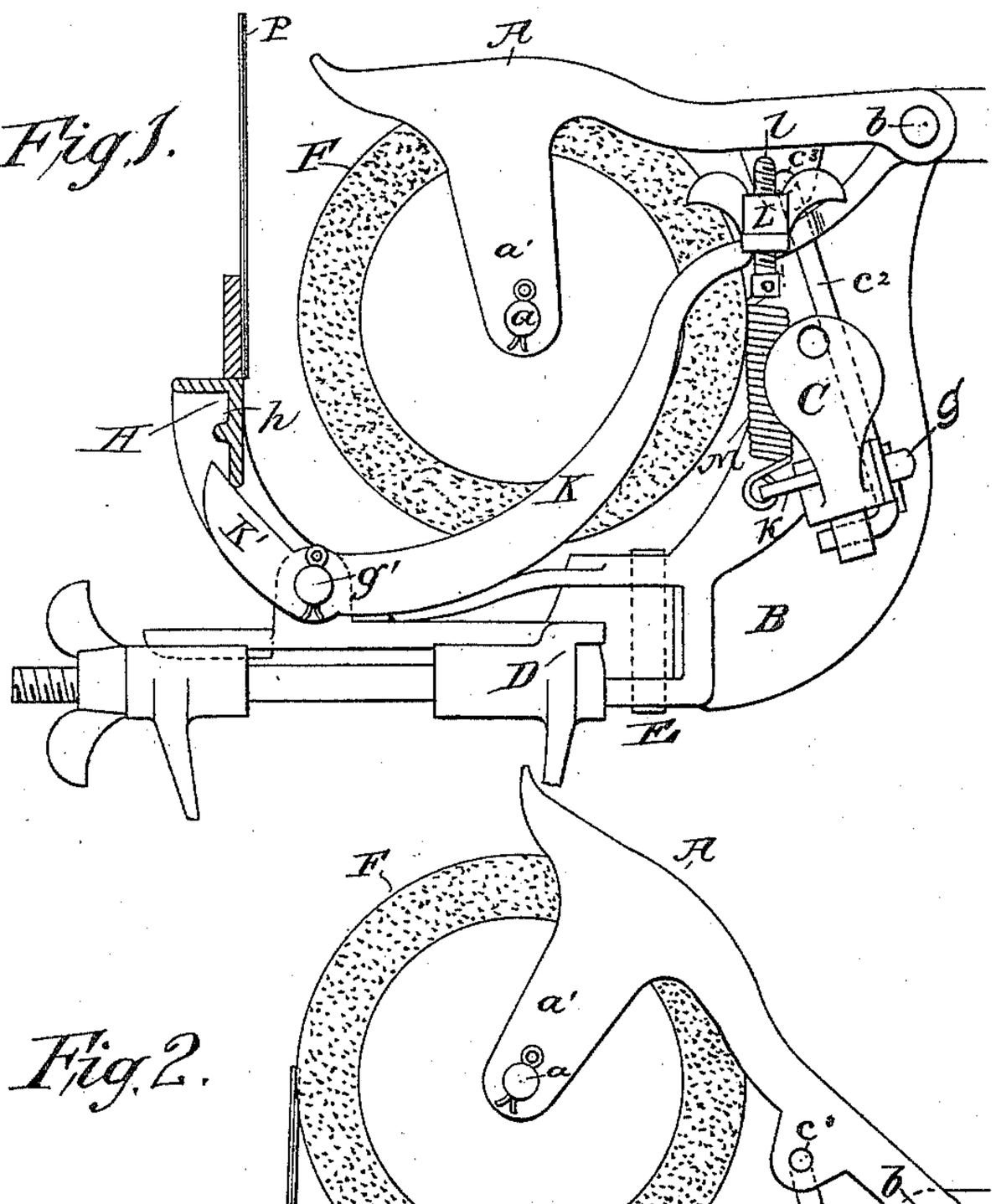
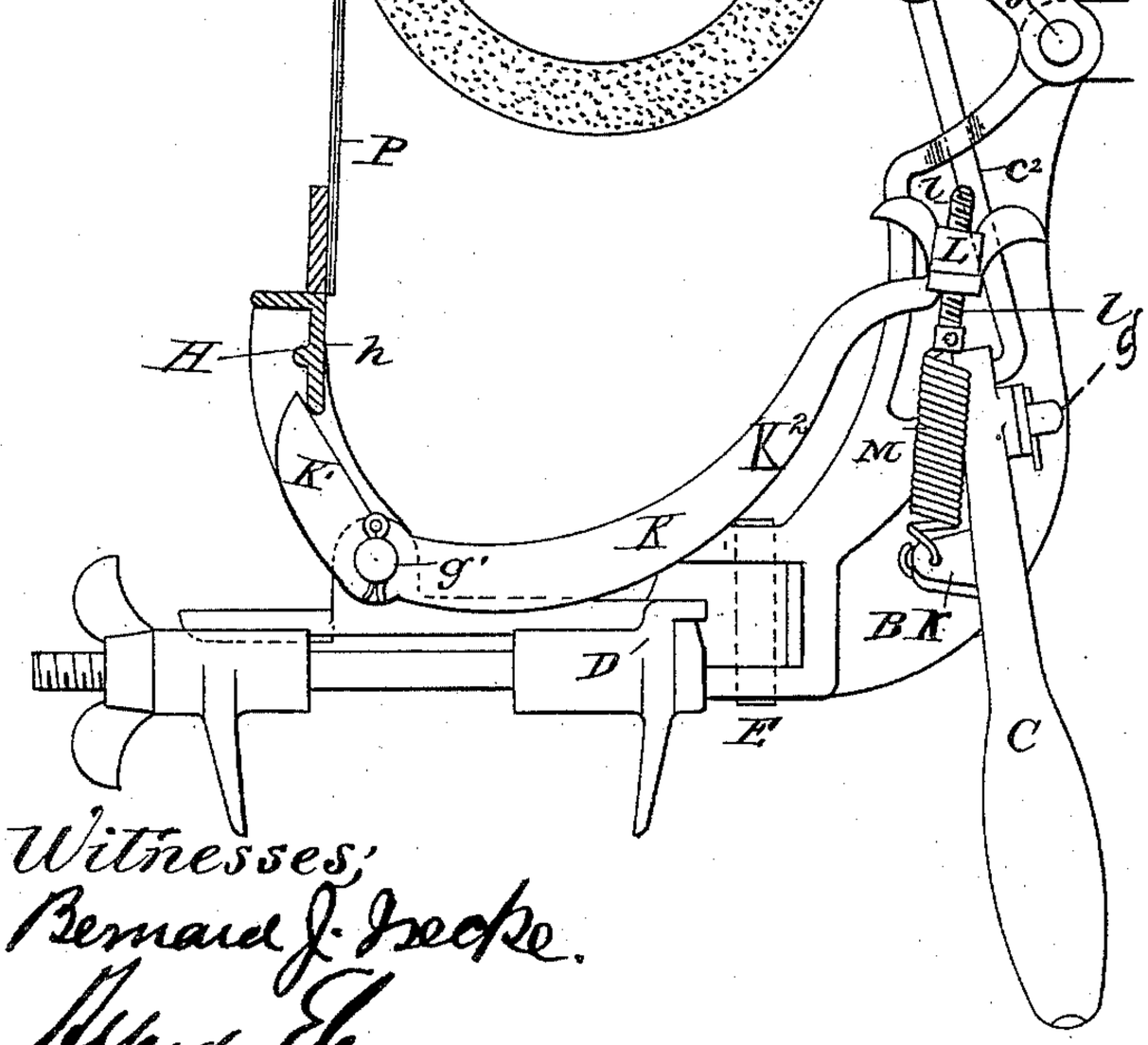


Fig. 2.



Witnesses;
Bernard J. Jacobs.
Lloyd Ely

Inventor;
Rufus Dutton.
by Dewalter Brown,
his attorney

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 5 Sheets—Sheet 2.

R. DUTTON.

MACHINE FOR GRINDING MOWER KNIVES.

No. 457,079. Patented Aug. 4, 1891.

Fig. 3.

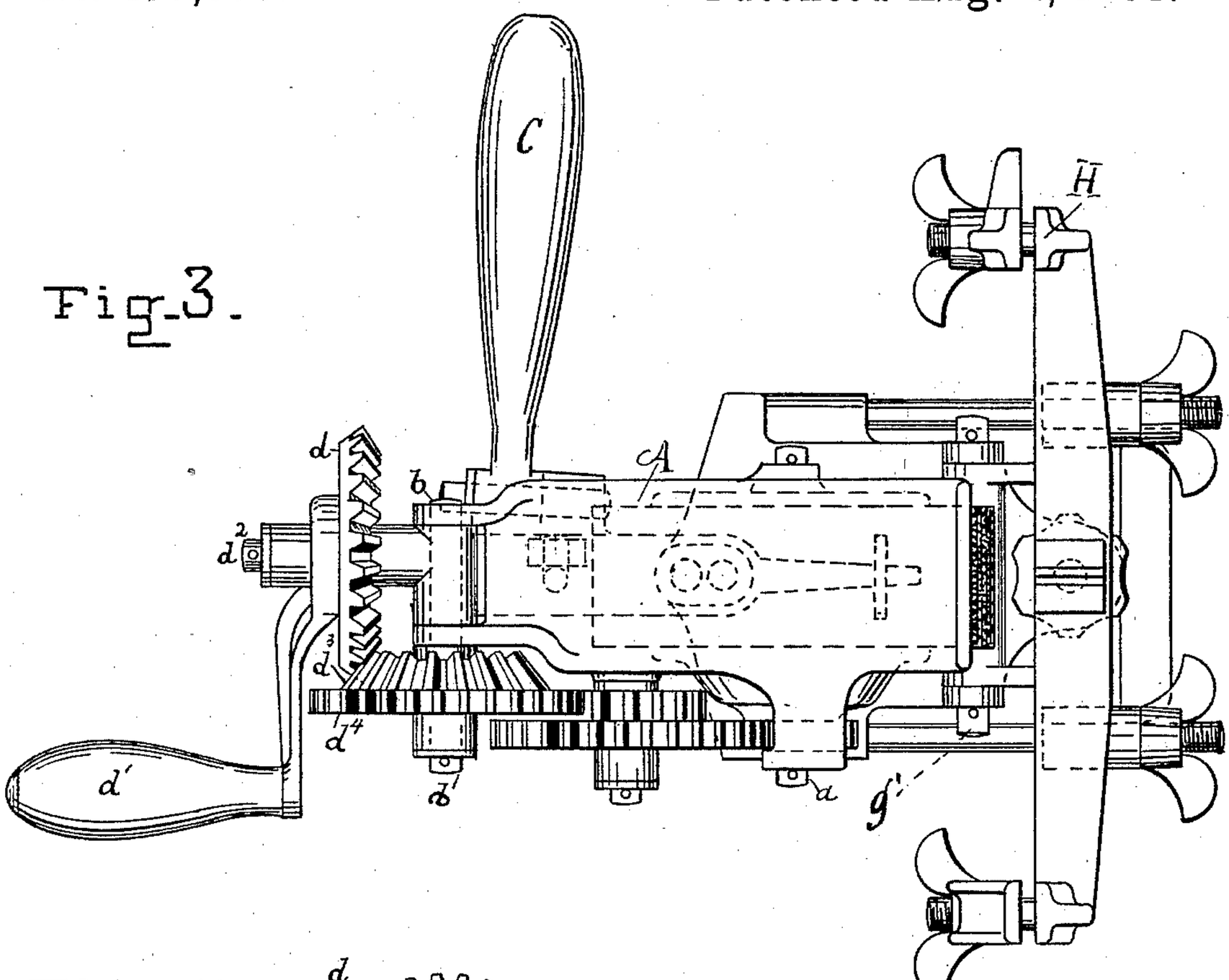
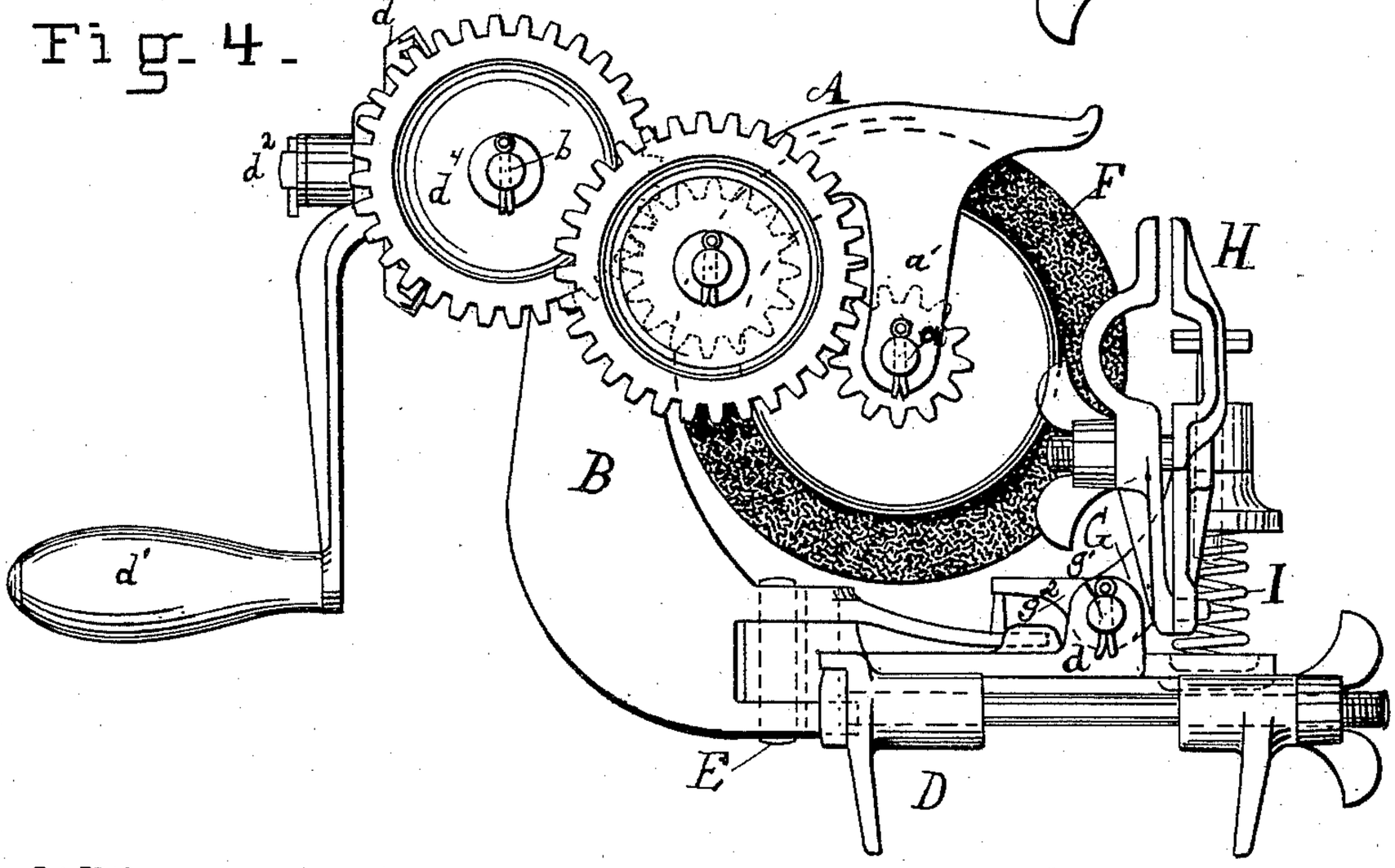


Fig. 4.



Witnesses:
Bernard J. Secker
Alfred Ely

Inventor.
Rufus Sutton
by Walter Brown
his Attorney

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 5 Sheets—Sheet 3.

R. DUTTON.

MACHINE FOR GRINDING MOWER KNIVES.

No. 457,079. Patented Aug. 4, 1891.

Fig. 5.

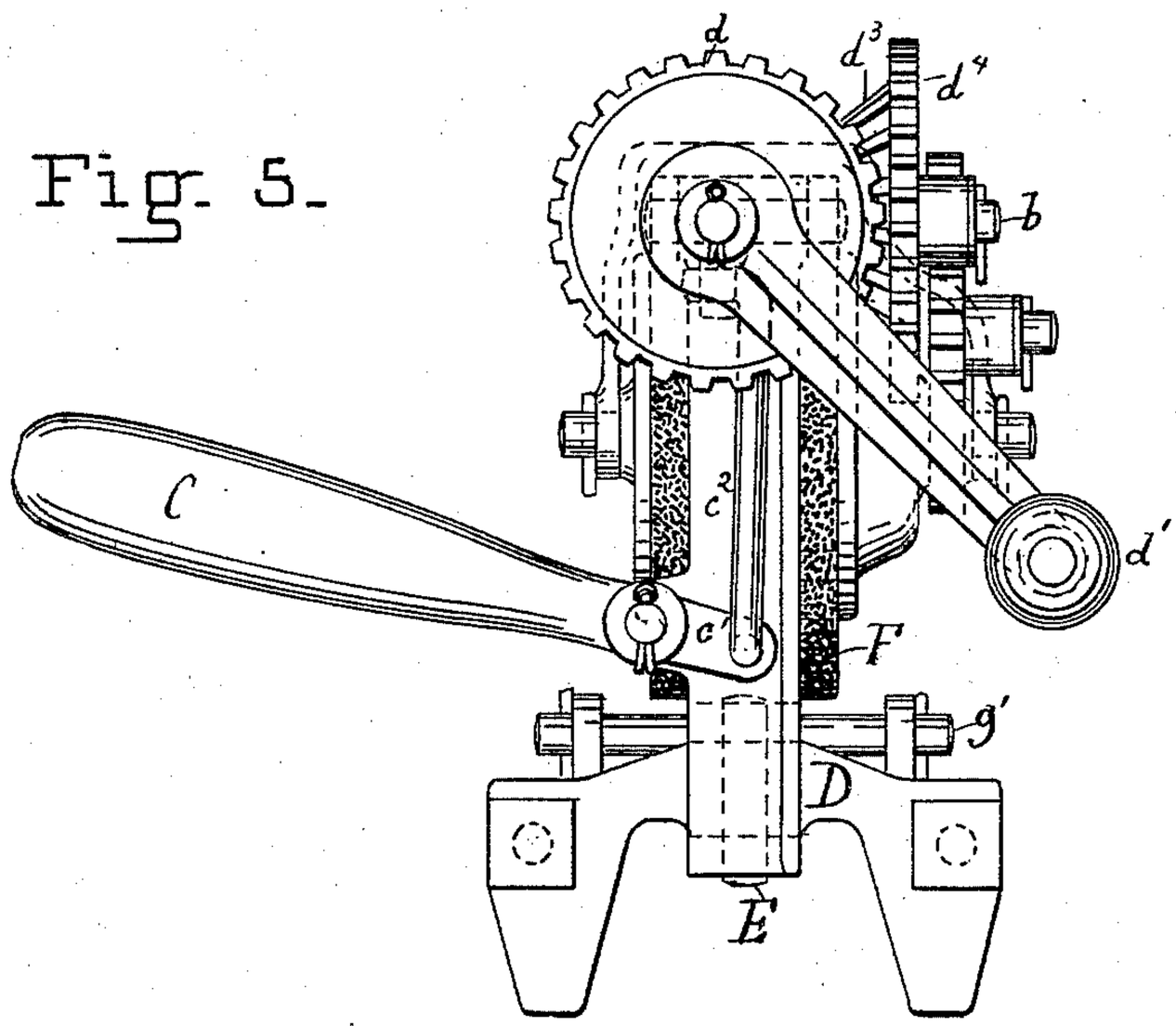
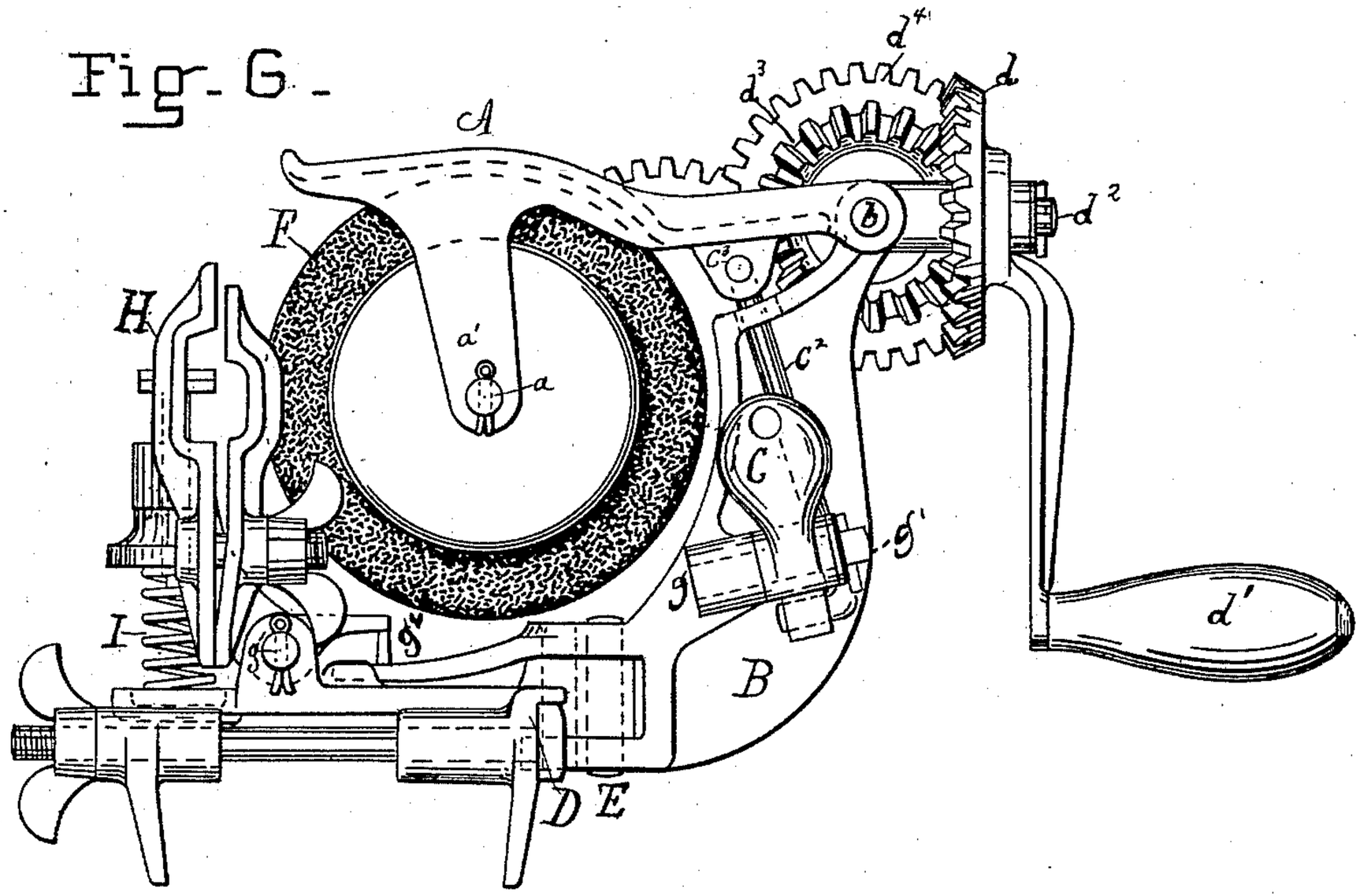


Fig. 6.



Witnesses:
Bernard J. Isecke
Lloyd Ely

Inventor.
Rufus Dutton
by Schaller Brown
his attorney.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 5 Sheets—Sheet 4.

R. DUTTON.

MACHINE FOR GRINDING MOWER KNIVES.

No. 457,079. Patented Aug. 4, 1891.

Fig. 7.

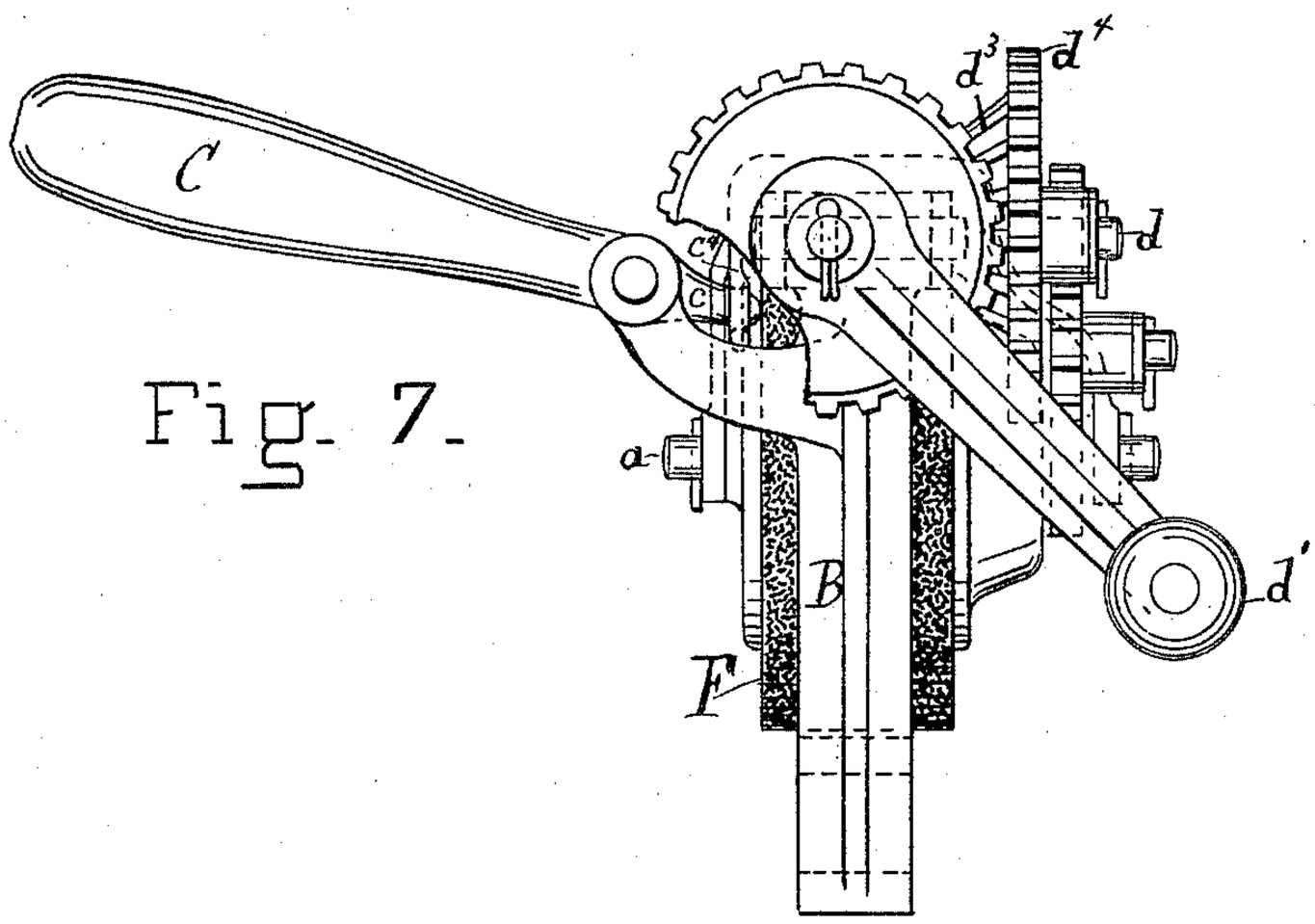
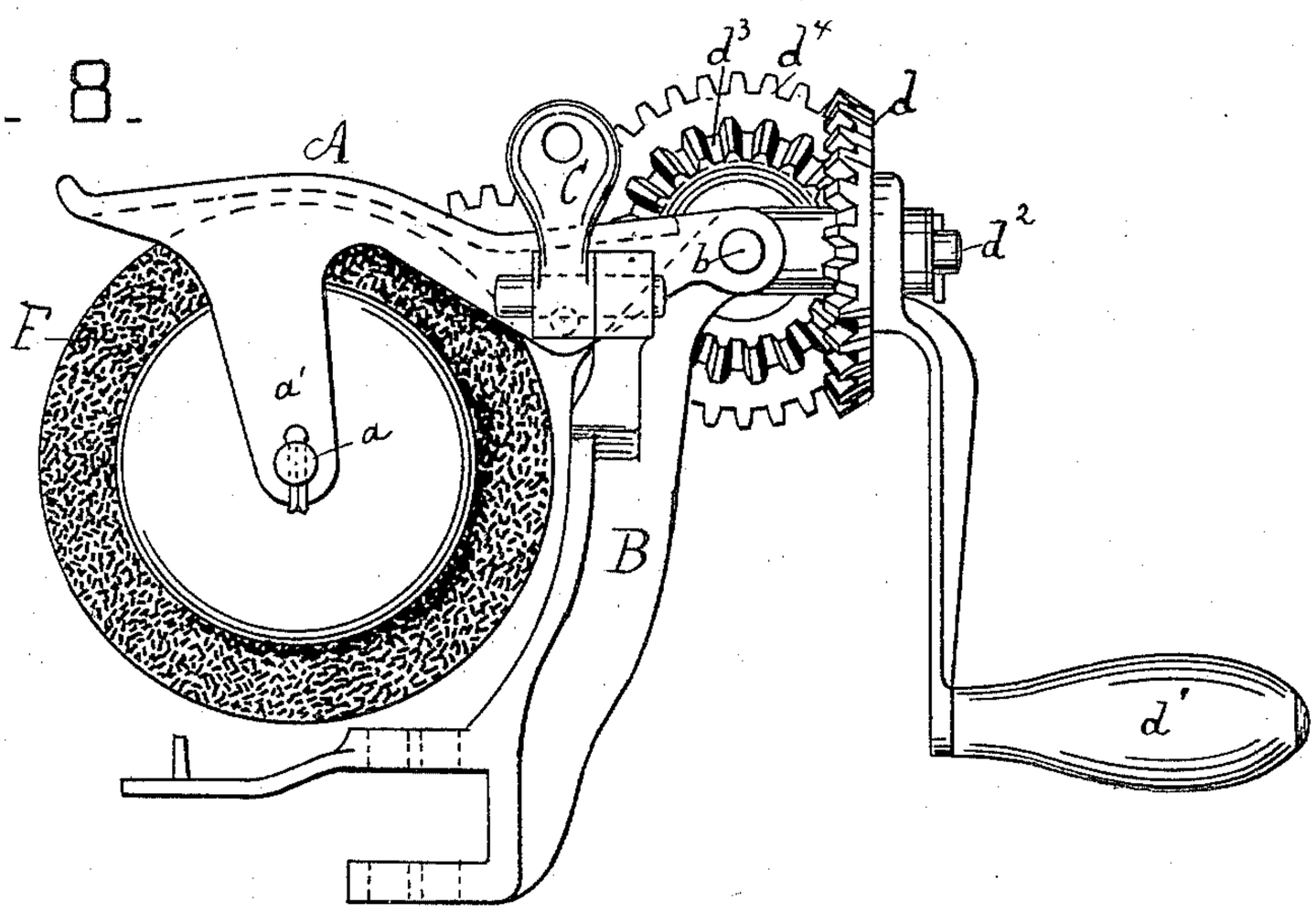


Fig. 8.



Witnesses:
Bernard J. Boeckle
Alfred Ely

Inventor.
Rufus Dutton.
by D. Walter Brown.
his attorney.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 5 Sheets—Sheet 5.

R. DUTTON.

MACHINE FOR GRINDING MOWER KNIVES.

No. 457,079. Patented Aug. 4, 1891.

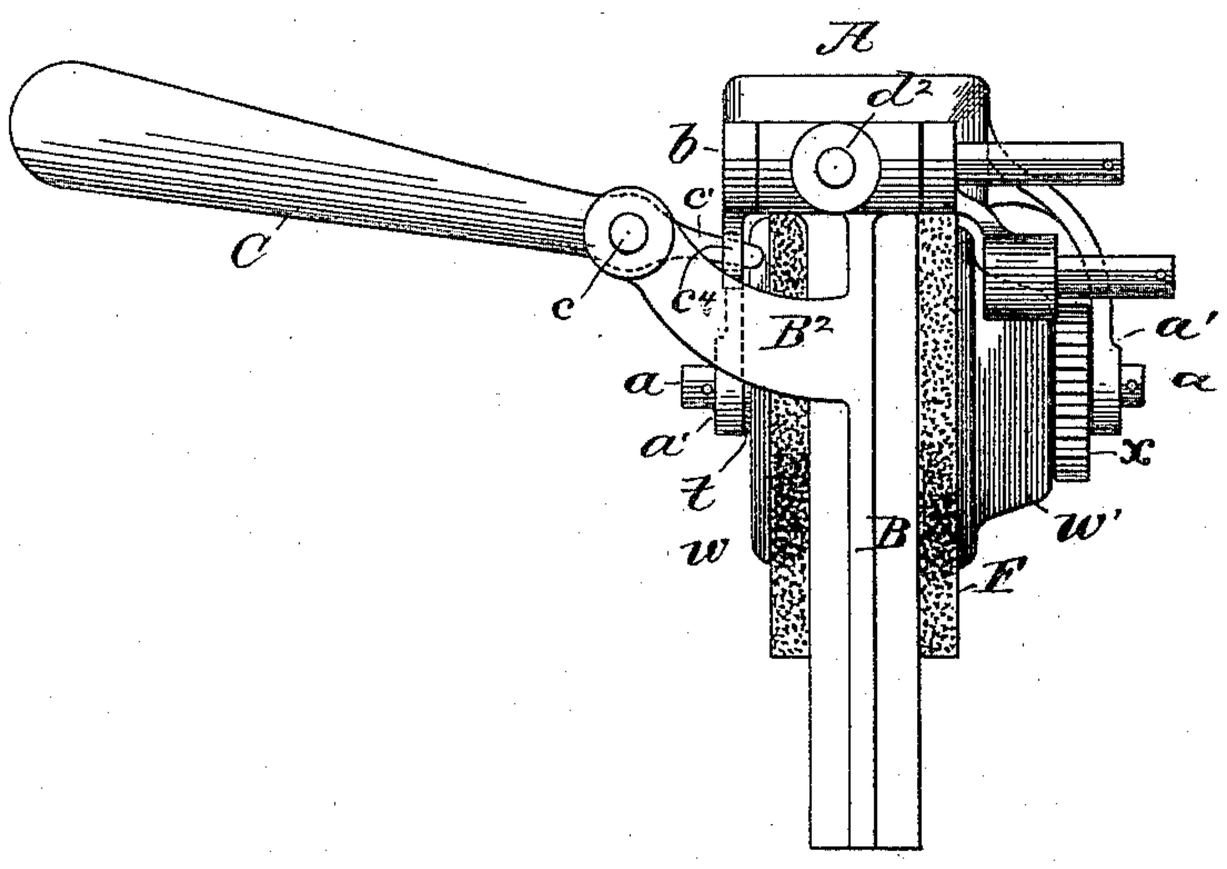


Fig. 9

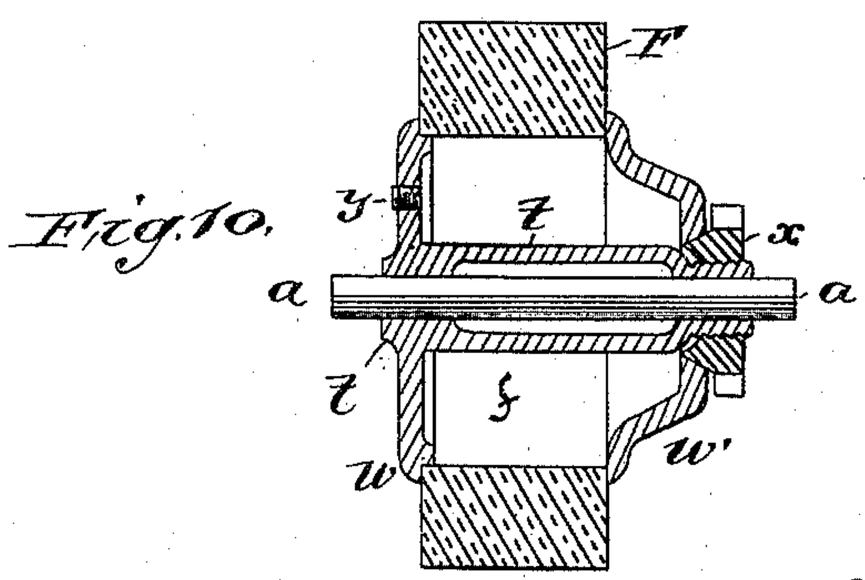


Fig. 10.

Witnesses:
W. M. Benjamin
Bernard J. Becker

Inventor:
Rufus Dutton.
by D. Walter Brown,
his attorney

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

RUFUS DUTTON, OF NEW YORK, N. Y.

MACHINE FOR GRINDING MOWER-KNIVES.

SPECIFICATION forming part of Letters Patent No. 457,079, dated August 4, 1891.

Application filed November 10, 1890. Serial No. 370,978. (No model.)

To all whom it may concern:

Be it known that I, RUFUS DUTTON, a citizen of the United States, and a resident of New York, in the county of New York, State of New York, have invented a certain new and useful Improvement in Machines for Grinding Mower-Knives, of which the following is a specification.

My said improvement relates particularly to that form of machine for grinding mower-knives which is set forth in Letters Patent of the United States, No. 395,615, granted to me January 1, 1889; but it is also intended to be used in connection with many of the features of the machines disclosed in Letters Patent of the United States Nos. 342,290 and 359,964, granted to me, and respectively dated May 18, 1886, and March 22, 1887.

In the first place my improvement consists in the means for equalizing the pressure of a knife-section on the grinding-wheel, throughout the operation of grinding. In the first above-mentioned patent—to wit, No. 395,615—this equalization of the pressure of a knife-section on the grinding-wheel is obtained by reciprocating the wheel-arm and grinding-wheel in a right line, which inclines upward toward the plane of the knife-clamp. The knife-clamp is drawn toward the grinding-wheel by a spring which connects the knife-clamp with the base of the machine, and consequently as the grinding-wheel rises from the V-notch between two knife-sections to the point of the section it approaches the original plane of the knife-section, whereby the tension of the spring upon the knife-clamp is increased. This increase of tension compensates for the greater leverage distance of the point of the knife-section from the hinge of the knife-clamp, and thereby the pressure of the knife-section upon the grinding-wheel is equalized from the V-notch to the point; but in the present machine the grinding-wheel does not reciprocate in a right line, but in the arc of a circle, and therefore the arrangement shown in the said Patent No. 395,615 is entirely inapplicable, for as the grinding-wheel rises toward the point of a knife-section its distance from the plane of the knife-clamp increases; but I have devised means appropriate to the present machine, whereby the pressure of the knife-section on the grinding-wheel is equalized, notwithstanding the varying distance of the grinding-wheel from the plane of the knife-clamp, and which means consists, generally, in a bent lever pivoted on the base of the machine and having an arm which engages the knife-clamp and presses the same toward the grinding-wheel, and also having another arm which is connected through a spring with the hand-lever, by means of which the grinding-wheel is reciprocated. Thus the reciprocation of the hand-lever causes a greater tension to come upon the spring as the grinding-wheel rises from the V-notch to the point of the knife-section, and this tension is transmitted through the bent lever to the knife-clamp. By this means the varying distance of the grinding-wheel from the knife-clamp and also the leverage distance of different portions of the knife-section from the hinge of the knife-clamp are compensated for, and the pressure of the knife-section on the grinding-wheel is equalized during the operation of grinding.

In the second place the said Patent No. 395,615 discloses a mower-knife-grinding machine wherein the gearing which actuated the grinding-wheel was organized so that the operator could stand facing one side of the grinding wheel and over the knife. This was effected by pivoting the crank and bevel-gear to which the crank was attached at right angles to the axis of the grinding-wheel, and by meshing the said bevel-gear with a bevel-gear in the train of gears which transmitted motion to the grinding-wheel. In the aforesaid machine, also, the wheel-arm was reciprocated in a right vertical line by means of a base portion of the wheel-arm sliding in a vertical guide in the wheel-frame. In order to maintain the train of gearing in mesh in connection with said rectilinear reciprocation of the wheel-arm it was necessary to pivot the whole train of gearing on the wheel-arm, and this required that the crank should rotate about a shifting center. In practice, however, it has proved inconvenient for the operator to rotate the crank when its center is continually shifting. It is the second object of the present improvement to overcome this inconvenience. To effect this I do away with the sliding portion of the wheel-arm and the guide on the wheel-frame and hinge the wheel-arm

parallel to the axis of the grinding-wheel upon the wheel-frame, and I also divide the train of gearing into two portions, one of which is mounted on the wheel-arm by pivots which are parallel to the axis of the grinding-wheel, and the other of which is mounted on the wheel-frame by a pivot, which is perpendicular to the axis of the grinding-wheel, and is connected with the crank. The two portions of the train of gearing are connected by a bevel-gear, which is formed integral with the first gear of that portion which is mounted on the wheel-arm, and is pivoted in line with the hinge of said wheel-arm. Thus throughout all the reciprocations of the wheel-arm the said bevel-gear rolls round the pitch-line of the gear, which is pivoted on the wheel-frame, and the two portions of the train of gearing remain always in mesh. This organization in mower-knife-grinding machines of gearing in two planes perpendicular to each other and connected through a gear pivoted in line with the hinge of the wheel-arm is highly useful and, I believe, novel. In the third place the rectilinear reciprocation of the wheel-arm necessitated that the hand-lever, which was used both for producing the said reciprocations and for oscillating the wheel-frame with respect to the knife-clamp should move through a long arc, and that when the grinding-wheel was grinding the upper part of the knife-section the said hand-lever should come so nearly in line with the swiveling pivot that it was not effective for oscillating the wheel-frame. To overcome this difficulty, I do away with the segmental gear on the hand-lever, which meshed with a rack on the sliding part of the wheel-arm, and connect the hand-lever with the wheel arm between the hinge thereof and the axis of the grinding-wheel, and thus a small vibration of the hand-lever is sufficient to effect the necessary reciprocations of the grinding-wheel, and the hand-lever is always at a considerable angle with the swiveling pivot, and is always effective for oscillating the wheel-frame.

Describing now the machine of the present application, I shall restrict the description principally to the constructions wherein the present application differs from my patents hereinbefore referred to.

Referring to the drawings, Figures 1 and 2 are side views of my machine with the gearing removed to show the equalizing-lever in two positions of the grinding-wheel. For sake of clearness the knife-clamp is shown only in part and in section. Figs. 3 and 4 represent an improved machine, respectively in top or plan view and in side elevation and without the equalizing-lever. Fig. 5 shows a portion in end view. Fig. 6 shows the side opposite to that shown in Fig. 4. Figs. 7 and 8 are respectively end and side views of modifications of the wheel-frame, illustrating how my invention can be attained with fewer parts. Fig. 9 is a view of the machine from the rear end with the gearing removed and showing the manner in which the hand-lever engages directly with the wheel-arm in that modification of the machine which is presented in Figs. 7 and 8. Fig. 10 is a section of the grinding-wheel and water-chamber.

The present machine may be divided into two main parts, known as the "grinding-wheel frame" and the "knife-clamp frame." The grinding-wheel frame consists of the wheel-arm A and the wheel-frame B. The wheel-arm A has lugs or side pieces a', which support the shaft a of the grinding-wheel F, and the said wheel-arm A is hinged to the wheel-frame B by a hinge b, which is parallel to the shaft a. A stud d^2, Figs. 3 and 4, is formed on this wheel-frame B and at right angles to the grinding-wheel shaft a, and on this said stud d^2 is mounted a bevel driving-gear d, to which the hand-crank d' is attached. The gear d meshes with a bevel-gear d^3, which is integral with a gear d^4, which gear d^4 is the driving-gear of a train of spur-gears which are mounted on the wheel-arm A and communicate motion to the grinding-wheel F. The aforesaid bevel-gear d^3 is mounted in line with the hinge b, and therefore the gear-train will remain in mesh with the bevel driving-gear d, whatever may be the reciprocations of the wheel-arm A about the hinge b. Thus by this organization of the hand-crank, bevel-gear, and spur-train I am able to mount a crank at right angles to the train of gears and on a part of the machine which is not shifted during the reciprocations of the grinding-wheel. The said reciprocations of the wheel-arm A and the grinding-wheel F are effected by means of a hand-lever C, which is pivoted on the wheel-frame B on a stud g, so that the hand-lever C stands out to one side of the machine in a position convenient for manipulation during the operation of grinding. The short arm c' of said hand-lever C is connected by means of a link c^2 with the wheel-arm A by means of ears c^3, which are situated on the wheel-arm A between the hinge b and the grinding-wheel F. Thus the wheel F can be reciprocated through the requisite distance for grinding with less movement of the hand-lever C.

As hereinbefore said, the wheel-arm A is hinged on the wheel-frame B. This wheel-frame B is swiveled upon a clamp-base D, as in my prior patents hereinbefore referred to, by a pivot E, which is perpendicular to the axis of the grinding-wheel F, and is placed under said grinding-wheel and substantially in a line with said axis, so that a part of the periphery of the grinding-wheel F is interposed between the pivot E and the knife-clamp H. Said knife-clamp H and the clamp-frame G are represented in the drawings as organized similarly to that shown in Patent No. 342,290, hereinbefore referred to, the knife-clamp H being supported on the clamp-frame G, which is hinged to the base D by the hinge g, formed of a rod g', which is parallel to the axis of the grinding-wheel F, and lugs d on the base D, and lugs g^2 on the knife-clamp frame G. The

aforesaid hand-lever C also serves to oscillate the wheel-frame G, as occasion may require. The organization of the knife-clamp H, frame G, and hinge *g* is similar to that shown in said Patent No. 342,290, and does not require detailed description here. The knife-clamp H holds a knife in a substantially vertical plane during grinding and presses said knife against the face of the grinding-wheel F at a point on said grinding-face which is substantially in the same horizontal plane as the axis of said grinding-wheel F, and said grinding-wheel F is supported on a non-rotatable shaft *a*, and is formed with a water-chamber *f* in its interior. The said water-chamber *f* is constructed in the following manner: There is a cylindrical central chamber through the grinding-wheel F, as shown in Fig. 10, and said grinding-wheel F is supported on a hollow hub *t*, which revolves on the axis *a*. The said hub *t* has a flange *w*, formed integral with it near one end, and a movable flange *w'*, basin-shaped, as seen in Fig. 10, on its other end. The flanges *w w'* are tightly clamped against the grinding-wheel F by a nut *x*, which is formed integral with the gear which drives the grinding-wheel F. There is an opening with plug *y* in the flange *w* to admit water to the chamber, and when the grinding-wheel F is rapidly revolved centrifugal action forces the water through the porous substance of the grinding-wheel F to the surface, which is thus kept wet during grinding. The said water-chamber is fully described in my Patent No. 340,290, and is no part of my present invention. It is evident that the grinding-wheel F reciprocates in the arc of a circle about the hinge *b* as a center, and that the said grinding-wheel moves away from the original plane of the knife-clamp H as the said grinding-wheel rises to the point of a knife-section P. (See Fig. 1.) To equalize the pressure of the knife-section P on the grinding-wheel F, notwithstanding this departure of the grinding-wheel, I employ a lever K, which is preferably in shape a bent or bell-crank lever, as shown, and has an arm K', which engages with a rib *h* on the knife-clamp H. The said lever K is pivoted on the base of the machine exactly in line with the hinge *g'* of the knife-clamp. A simple arrangement is that shown in Figs. 1 and 2, where knife-clamp-hinge rod *g'* is utilized as a pivot for the lever K. Thus the said lever-arm K' and the knife-clamp H become in effect a single member, and both move in unison about the center *g'*, and there is no lost motion between the arm K' and the knife-clamp H. Beside the aforesaid arm K', the lever K also has an arm K^2, which is curved upward in any desired shape, and has a set-screw *l* passed freely through a hole in its end. Threading on its screw *l* is a thumb-nut L, by which the screw *l* can be drawn different distances through the lever-arm K^2. A spring M connects the head of the screw *l* with a lug *k* on the hand-lever C, and the screw *l* is so placed that when the grinding-wheel F is normally over the middle line of the machine the screw *l* is vertically above the lug *k*. Thus when the grinding-wheel is oscillated to the right hand and to the left hand in order to grind the beveled edges of adjacent knife-sections, the distance from the lug *k* to the screw *l* will be equal in both of said positions of the grinding-wheel, and the spring M will therefore act equally well in both of said positions.

From the foregoing description it is evident that as the hand-lever C is depressed in order to raise the grinding-wheel F from the V-notch to the point of a knife-section, the said hand-lever C will put a continually-increasing tension on the spring M, which will be transmitted through the lever K to the knife-clamp H, and thereby the knife-clamp H will be drawn toward the grinding-wheel F with a constantly-increasing pressure as said grinding-wheel rises to the point of a knife-section, and thus the pressure of the knife-section on the grinding-wheel will be equalized throughout the operation of grinding, notwithstanding the departure of the grinding-wheel F from the original plane of the knife-clamp H. Evidently the spring M may be arranged as a compression-spring instead of as a tension-spring, as shown. The purpose of the thumb-nut L is to regulate the tension of the spring *l*.

In operation it is evident that when the wheel-arm A, together with the grinding-wheel F, is oscillated to the right-hand about the pivot E the left-hand edge of the face of the grinding-wheel F will be adjacent to the left-hand edge of a certain knife-section which is to be ground, as has been clearly described in the patents hereinbefore referred to. The machine is organized to begin grinding at the bottom of the V-notch between two knife-sections, when the wheel-arm A and grinding-wheel F are at their lowest position, as seen in Fig. 4, and by means of the hand-lever C the wheel-arm A and grinding-wheel F are raised so that the knife-section is ground upward from the bottom of the V-notch to the top of the section.

While the lever K is of very great utility in equalizing the pressure of knife-section on the grinding wheel, it is evident that the organization of the train of gearing in its two divisions and the hand-lever C with the link C^2 may be used in connection with other means for holding the knife-clamp against the grinding-wheel. In Figs. 3 to 6, inclusive, I show completely-organized machines which dispense with the lever K, and substitute a spring I for pressing the knife-clamp H against the grinding-wheel. This spring I is similar in its form and arrangement to that shown in my patent, No. 342,290, and does not require description here. The arrangement and operation of all the other parts of the machines represented in said Figs. 3 to 6 have been

fully hereinbefore described, and further description is not needed.

In Figs. 7, 8, and 9 are shown a modification of the machine, wherein the link c^2, which connects the hand-lever C with the wheel-arm B, is dispensed with, and the short arm c' of said hand-lever engages directly with an eye c^4, which is formed in the wheel-arm A, at a point between the hinge b and the grinding-wheel F.

I claim—

1. In mower-knife-grinding machines, a grinding-wheel mounted on a wheel-arm which is hinged on a wheel-frame, a hand-lever pivoted on the wheel-frame so as to oscillate in a plane which is substantially parallel with the axis of the grinding-wheel and having an arm which connects with the wheel-arm between the wheel-arm hinge and the axis of the grinding-wheel, a knife-clamp hinged parallel to the axis of the grinding-wheel, and a lever pivoted in line with the knife-clamp hinge and having an arm engaging with the knife-clamp and also an arm which is connected by means of a spring with the aforesaid hand-lever, as described.

2. In mower-knife-grinding machines, the organization of a grinding-wheel mounted on a wheel-arm which is hinged parallel to the axis of the grinding-wheel on a wheel-frame, and a train of gearing for rotating the grinding-wheel, divided into two portions, one of which is pivoted parallel to the axis of the grinding-wheel on the wheel-arm and the other of which is connected with a crank and pivoted perpendicular to the axis of the grinding-wheel on the wheel-frame and the two portions of the train of gearing maintained in mesh through a bevel-gear which is pivoted on the wheel-arm in line with the hinge thereof, as described.

3. In a mower-knife-grinding machine, the combination of a knife-clamp and its frame, a grinding-wheel and its frame, and the two frames swiveled with respect to each other by a pivot which is perpendicular to the axis of the grinding-wheel and substantially in line therewith, and a grinding-wheel arm hinged on the grinding-wheel frame parallel to the axis of the grinding-wheel, and a hand-lever for oscillating the wheel-frame and for reciprocating the wheel-arm pivoted on the wheel-frame, so as to oscillate in a plane substantially parallel to the axis of the grinding-wheel, and having an arm connecting with the wheel-arm between the aforesaid hinge and the axis of the grinding-wheel, as described.

4. In a mower-knife-grinding machine, the combination of a knife-clamp frame and a grinding-wheel frame and the said frames swiveled with respect to each other by a pivot which is perpendicular to the axis of the grinding-wheel and substantially in line therewith, a grinding-wheel arm hinged parallel to the axis of the grinding-wheel on the grinding-wheel frame, a train of gearing divided into two portions, one of which is pivoted on the wheel-arm parallel to the axis of the grinding-wheel and the other connected with a crank and pivoted on the wheel-frame perpendicular to the axis of the grinding-wheel, and the two portions of the train of gearing meshing through a bevel-gear which is pivoted on the wheel-arm in line with the hinge thereof, and a hand-lever for oscillating the wheel-frame and reciprocating the wheel-arm pivoted on the wheel-frame, so that the lever oscillates in a plane substantially parallel with the axis of the grinding-wheel, and an arm of the lever connected with the wheel-arm between the hinge thereof and the axis of the grinding-wheel, as described.

5. In a mower-knife-grinding machine, the combination of a grinding-wheel arm supporting a grinding-wheel and hinged parallel to the axis of said grinding-wheel upon a grinding-wheel frame, a lever pivoted on said frame, so that the lever projects out sidewise from said machine and in a plane subtially parallel to the axis of the grinding-wheel, and an arm of the lever connecting the grinding-wheel arm between the aforesaid hinge and the axis of the grinding-wheel, as described.

6. In a mower-knife-grinding machine, a lever pivoted in line with the hinge of the knife-clamp frame and having an arm which engages with the said knife-clamp frame, and also an arm which is connected by a spring with the hand-lever by which the grinding-wheel is reciprocated, as herein described.

In testimony that I claim the foregoing as my invention, I have signed my name, in presence of two witnesses, this 30th day of October, 1890.

RUFUS DUTTON.

Witnesses:
BERNARD J. ISECKE,
JOHN G. AGAR.