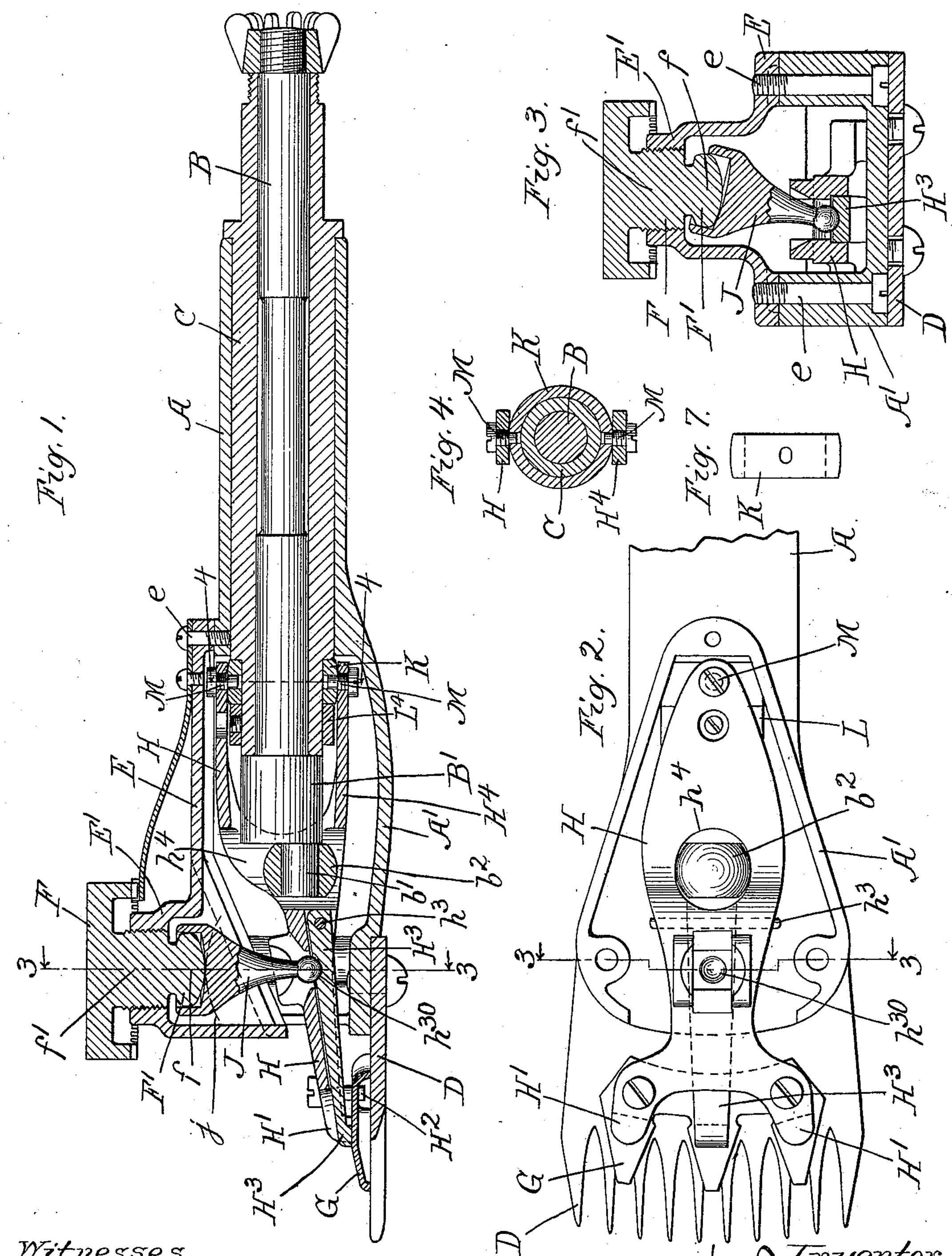
No. 646,377. Patented Mar. 27, 1900.

J. K. STEWART.

SHEARING TOOL.

(Application filed Dec. 7, 1898.)

(No Model.) 2 Sheets—Sheet 1.



Witnesses.
Edward T. Wray.
Jean Elliott.

Inventor.
John K. Stewart
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his attys

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

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Fig. 5.

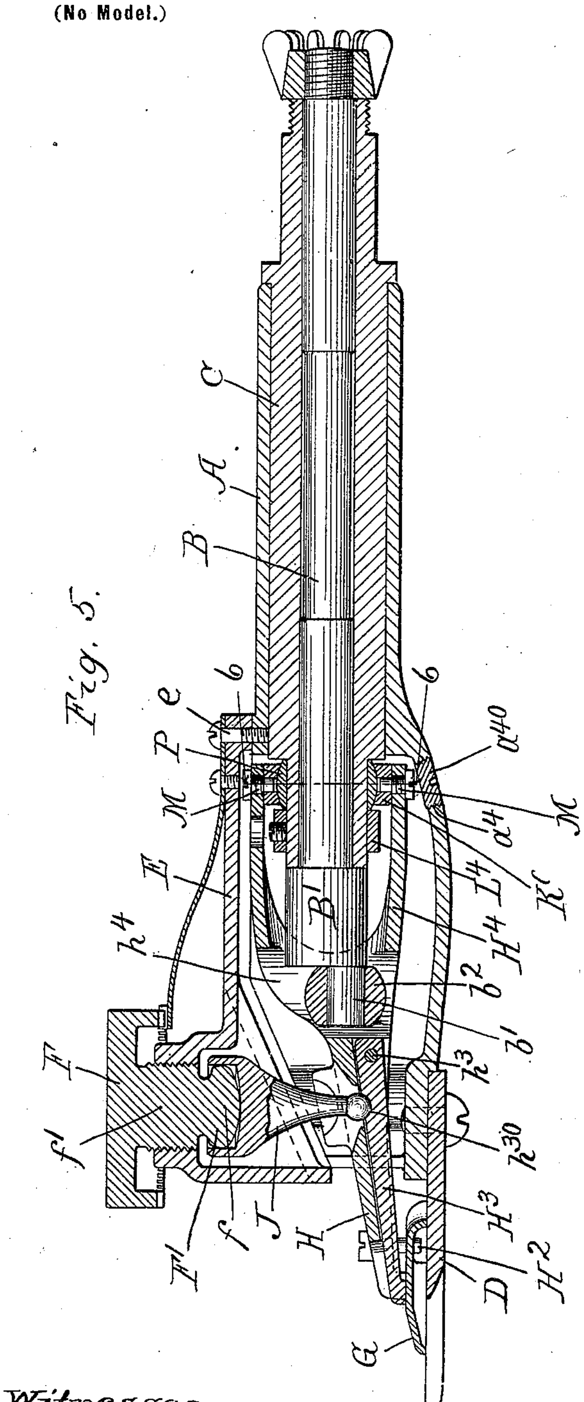
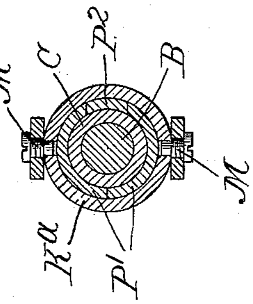


Fig. 6.



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UNITED STATES PATENT OFFICE.

JOHN K. STEWART, OF CHICAGO, ILLINOIS.

SHEARING-TOOL.

SPECIFICATION forming part of Letters Patent No. 646,377, dated March 27, 1900.

Application filed December 7, 1898. Serial No. 698,528. (No model.)

To all whom it may concern:

Be it known that I, JOHN K. STEWART, a citizen of the United States, residing at Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Shearing-Tools, which are fully set forth in the following specification, reference being had to the accompanying drawings, forming a part thereof.

In the drawings, Figure 1 is a longitudinal section of my improved shearing-tool at right angles to the plane of the cutters. Fig. 2 is a top plan of the lower member of the tool, the shank or handle being broken away and the cap and tension devices removed. Fig. 3 is a section at the line 3 3 on Figs. 1 and 2, showing the position of the parts when the moving cutter is at the extreme of its oscillation. Fig. 4 is a section at the line 4 4 on Fig. 1. Fig. 5 is a longitudinal section similar to Fig. 1, showing a slightly-modified form of pivotal joint for the cutter-actuating lever-arm. Fig. 6 is a section at the line 6 6 on Fig. 5. Fig. 7 is an edge elevation of a swivel-ring forming part of the cutter-operating-lever connections.

My present invention consists of certain detail improvements in the devices for pivoting and applying pressure to the cutter-actuating lever-arm and pressure-bar, the purpose of said improvements being to avoid inequality of pressure exerted upon the oscillating cutter at different parts of its path and rendering the device in respect to this feature less sensitive to slight derangements of position of the parts, such as are liable to be caused in the readjustments incident to use, cleaning, &c.

A is the shank, in which is provided the bearing for the driving-shaft B, a steel bushing C being driven into the shell of the shank to afford such bearing and projecting through the shank proper at the inner or forward end into the expanded portion A′, which I term the "housing" and to which, at the forward end and lower side, the fixed cutter or comb D is made fast.

E is the cap or upper plate of the shell or housing. It is secured to the lower member or body-piece A A′ by screws *e e e*. The cap E has the boss E′ vertically apertured and interiorly threaded to receive the tension-screw F.

G is the oscillating cutter. It is engaged, actuated, and pressed upon the lower cutter by the cutter-actuating and pressure arm or lever H. This arm is forked at the forward end, and two fork-fingers H′ H′ bear upon the upper surface of the outer of three teeth of the cutter G and are also provided with pins H^2 H^2, which are screwed through the fingers from the upper side and project downward into suitable apertures in the cutter G, whereby the pressure and lever arm positively engages said cutter to oscillate it.

The forward end of the shaft has a customary crank device consisting of the enlarged head B′, having the crank-pin stud b', on which is mounted a spherical antifriction-roller b^2, which is provided with a vertical cylindrical trackway at h^4 in the lever-arm H, whereby the rotation of the shaft causes the crank to oscillate said lever about its fulcrum, hereinafter described. To insure clean cutting, all three of the teeth of the cutter C should receive direct pressure holding them on the fixed cutter. If the pressure-arm had three fingers bearing on the three teeth, respectively, all said teeth being rigid, absolute accuracy of construction would be necessary to secure transmission of pressure to all three of the teeth, for if either one of the fingers of the pressure-lever were a trifle longer than the others, or if any one of the three teeth of the cutter were slightly more or less worn on the cutting-face than on the remainder, or if any foreign matter, however slight, should become interposed between any finger of the lever and the cutter the whole pressure would be received by one tooth and the other teeth would experience only such pressure as might be transmitted by the stiffness of the cutter from the point of pressure upon that one tooth. To avoid this difficulty, it is necessary to make one of the three fingers of the lever otherwise than rigid with the other two, and for this reason I provide the finger H^3, pivoted to the lever-arm H at h^3 and extending under the web of the lever-arm forwardly between the two rigid fingers and bearing upon the middle tooth of the cutter G. The necessary pressure is applied to the lever-arm by means of the adjusting-screw F and a pressure-pin, commonly called a "dolly," J. The dolly is stepped at h^{30} on the upper surface of the pivoted finger H^3, the web of the main arm of the lever being apertured to admit the dolly through the pivoted finger. The distance of the step h^{30} from the pivot h^3 is so related to the entire length of the finger and to the distances from the pivot h^3 to the end of the fingers H′ and to the fulcrum, respectively, of the lever as to cause the pressure exerted on the three teeth of the cutter G to be substantially equal.

In respect to its function of transmitting the desired pressure to the cutter the dolly operates precisely as if stepped directly on the main arm of the lever, and the finger H^3 being considered part of the lever the dolly may be referred to in general terms as "stepped" on the lever. As the lever oscillates, the step of the dolly being carried to right and left of a vertical line through the center of its spherical foot, it is evident that if said dolly were connected at its upper end at a fixed pivot the pressure exerted by it on the lever, and thereby on the cutter, would be lost as soon as it passed either way from its central or vertical position, and that in order to cause it to maintain continuous and uniform pressure provision must be made at its upper end for compensating for the increased distance of the foot from any fixed point as the lever oscillates away from the central position. This result has been measurably accomplished heretofore by making the upper end of the dolly convex and approximately spherical, the radius of curvature of such convex head being such as to afford the compensation necessary while operating against a perfectly-horizontal surface, such horizontal surface being provided at the lower end of the tension-screw. The difficulty experienced in the use of such a structure arises from the fact that absolute parallelism between the flat end of the tension-screw and the plane of movement of the cutter is necessary and if not maintained the cutter will bind at one end of its path and be slack at the other end. It is practically impossible to maintain such parallelism in continued use of the tool, very slight springing of the parts, such as is liable to occur in use, the accidental interposition of fibers of wool or hair or particles of dirt between the cap and the body when assembling the parts, or an accidental bruising of the seat of the body upon which the cap rests at one side or the other being frequent causes of disturbance in the parallelism of the two surfaces and making necessary the utmost care and extreme precision to insure even measurably-uniform pressure and causing the tool in the hands of an inexpert operator to be practically never entirely correct in adjustment in this respect. This difficulty I have avoided by the construction shown in the drawings, in which the upper end of the dolly is provided with a socket having cylindrical walls and terminating the tension-screw with a knob or head F′, whose circumferential periphery is curved in the form of a middle segment of a sphere whose diameter is that of a cylindrical socket of the dolly and whose center is in the axis of the tension-screw, as at f, so that the dolly working about such knob with an oscillatory movement has its axis maintained always in line intersecting at some point the axis of the tension-screw or so that if the dolly were connected by a horizontal pivot through the center f it would swing about the knob, maintaining the inner cylindrical surface of its socket in contact with the spherical periphery of the knob. The end of the knob of the tension-screw is convex in the form of a segment of a sphere whose center is at f' in the axis of the tension-screw and considerably above the center f, so that a plane being located horizontally through the center f the vertical distance from said plane to the spherical end of the tension-screw decreases from the center outward. The bottom of the socket in the dolly is concave upwardly, so that the distances of points in this surface from the center of the spherical foot of the dolly increase from the center outward of an amount equal to the divergence from such concave seat to an arc j, struck about said center of said spherical foot. The radii of the concave bottom surface of the socket and of the convex end of the tension-screw may be such that the sum of the variations above noted—to wit, in the distance of different points of the convex surface of the knob from a horizontal plane and the difference in the distances of points in the concave bottom of the socket from the spherical arc about the center of the foot—shall compensate for the leaning of the dolly as its foot oscillates with the same degree of accuracy as the same result may be effected in the employment of a spherical convex head of the dolly operating against a flat end of the tension-screw; but the convex end of the knob being at all points equally distant from the center f' and this center being midway between the opposite side bearings of the cap in the body any slight dislocation of the cap caused by the abrasion of its seat or interposition of foreign matter between it and its seat at one side or the other or inequality of such surfaces at opposite sides has practically the effect merely of tilting the cover approximately about the center f' or of so tilting it slightly and at the same time elevating that center very slightly. The tilting about this center of the convex end of the tension-screw does not disturb the relations of the parts nor increase or diminish the distance from the foot of the dolly at any point in its oscillation to the bearing-surface on the end of the tension-screw directly above that point, and the slight elevation of said center f' may of course be directly compensated by corresponding adjustment of the tension-screw in the boss E′, and it thus results that the substitution of the concave surface of the bottom of the socket in the dolly for the convex end of the dolly in former structures and the substitution of the convex end of the tension-screw for the flat end of the former structures avoids the difficulty experienced in the use of such former structures.

It will be observed that the cutter-actuating and pressure lever has three movements about its fulcrum—first, a horizontally-oscillating movement by which it actuates the cutter; second, the slight vertical oscillation necessary in the adjustments of tension above considered, and, third, an axial oscillation which is necessary to allow the oscillating cutter to accommodate itself at all times to the surface of the fixed cutter in which it bears, and thus to avoid binding or cramping at any stage. To afford facility for these three movements without imposing a cramping or binding strain upon any of the parts on account of any of these movements, the lever requires practically a universal joint at its fulcrum. Such joint is shown in two forms. In Figs. 1 to 4 a loose ring or sleeve K is seated in the reduced inner end of the bushing C, being retained by a collar L, and to this ring the cutter-actuating lever and pressure-arm is pivoted, being preferably branched at the rear end, so as to stride the ring and obtain a pivot-bearing thereon both at the upper and lower side of the latter, pivot-studs M M being set into the ends of both arms or branches of the lever, so as to engage the ring at diametrically-opposite points. In the form shown in Figs. 1 and 2 the slight vertical movement required for the adjustment of the tension is accommodated by slight and almost imperceptible elongation of the sockets in the ring into which the pivot-studs take and the axial oscillation of the swivel-like movement, it will be seen, is afforded by the ring K being free to rotate about its seat on the bushing.

In Figs. 5 and 6 I have shown a structure adapted to accomplish the same result with somewhat more strictness of mechanical construction. In the form shown in these figures the bushing has a spherical swell or knob-like seat provided on the forward reduced end, and a ring corresponding to the ring K and indicated by the letter K^a has correspondingly spherical concave inner surface adapted to seat on the spherical knob and to have movement thereabout both for the purpose of vertical oscillation and of the axial or swivel-like oscillation of the lever. The pivot-studs M M in the two arms of the lever engage the ring K^a at diametrically-opposite points at top and bottom, and the lever is thereby fulcrumed for the purpose of its cutter-actuating movement, as in the other form; but the vertical play required for the tension adjustment being in this form provided for by the spherical bearing which the ring has on the bushing the pivot-studs may fit accurately without longitudinal play in the pivot-sockets of the ring. For convenience in assembling this form of joint I prefer to make the spherical knob on which this ring K^a seats in the form of a ring P, lodged on the cylindrically-reduced end of the bushing and retained by a collar L^4 in the same manner as the ring K is retained in the form shown in Fig. 1, and in order to introduce this exteriorly-spherical ring into the concave seat provided for it in the ring K^a, I make the former of three parts, as shown in Fig. 6, the two larger parts P′ P′ being each enough less than half of the entire ring to permit them to be introduced into the concave seat, and these being placed in contact at one end the third piece P^2 can be introduced between their opposite ends, filling out the circle. The parts thus assembled can then be introduced bodily on the cylindrically-reduced bushing and followed by the retaining-collar L^4. In both forms, to assemble on the lever between the fulcrum-arms all the parts which are to be retained on the sleeve by the collar L^4, and to introduce the lever-arm with the parts thus assembled over the crank-head, the spherical antifriction-roller b^2 on the crank-pin is removed therefrom and placed in position in the cylindrical trackway provided for it in the lever, and the crank-pin is entered into the roller by the same movement by which the ring is passed onto the bushing.

I claim—

1. In a shearing-tool, in combination with the fixed cutter or comb, the oscillating cutter and its actuating pressure arm or lever; a shell or base in which said parts are mounted and with which the comb is rigid; a removable cap and a tension-screw set through the cap; a pressure-pin pivotally stepped in the pressure-arm and provided with a head whose center is nearer the pivotal center of the step than any other point on said head; the tension-screw having a spherical convex lower end on which the pressure-pin head bears and has a rolling action, the curvature of the tension-screw terminal and form of the pressure-pin head being together calculated to compensate for the oscillation of the pin.

2. In a shearing-tool, in combination with a fixed comb or cutter, the oscillating cutter; a shaft from which movement is communicated to said cutter, a ring swiveled about the bearing of the shaft, and the cutter-actuating lever pivoted to said ring at a line substantially at right angles to the plane of oscillation of the cutter.

3. In a shearing-tool, in combination with a fixed comb or cutter, the oscillating cutter; the shaft from which such cutter derives its motion; a ring swiveled about the bearing of the shaft; a crank on said shaft forward of said bearing; the cutter-actuating lever pivoted to the ring at a line at right angles to the plane of oscillation of the cutter, and engaged and actuated by the crank forward of said pivot.

4. In a shearing-tool, in combination with the fixed comb or cutter, the oscillating cutter; the driving-shaft journaled in bearings fixed with respect to the fixed cutter and having a crank-wrist pin at the forward end, the cutter-actuating lever engaging at the forward

end the oscillating cutter and being engaged intermediate the same by the crank-wrist being extended at the rear both above and below the shaft-bearing and pivoted to the latter at diametrically-opposite points thereon in a line at right angles to the plane of oscillation of the cutter.

5. In a shearing-tool, in combination with a fixed comb or cutter; the driving-shaft; the oscillating cutter and its actuating-lever, the fulcrum of said lever-arm being provided by means of a ring swiveled about the bearing of the shaft and to which the lever is pivoted in a line at right angles to the plane of oscillation of the cutter.

6. In a shearing-tool, in combination with a fixed comb or cutter, the oscillating cutter and its actuating-lever arm, the fulcrum of said lever being formed by means of a ring having a spherical seat about the bearing of the shaft and provided with diametrically-opposite pivot-studs for the lever in a line at right angles to the plane of oscillation of the cutter.

In testimony whereof I have hereunto set my hand, in the presence of two witnesses, at Chicago, Illinois, this 3d day of December, 1898.

JOHN K. STEWART.

Witnesses:

S. A. STOKES,

M. LINDIG.