J. B. Morrison,

Dental Drill.

No. 106,498. Patented Aug 16. 1870.

Fig. 1.

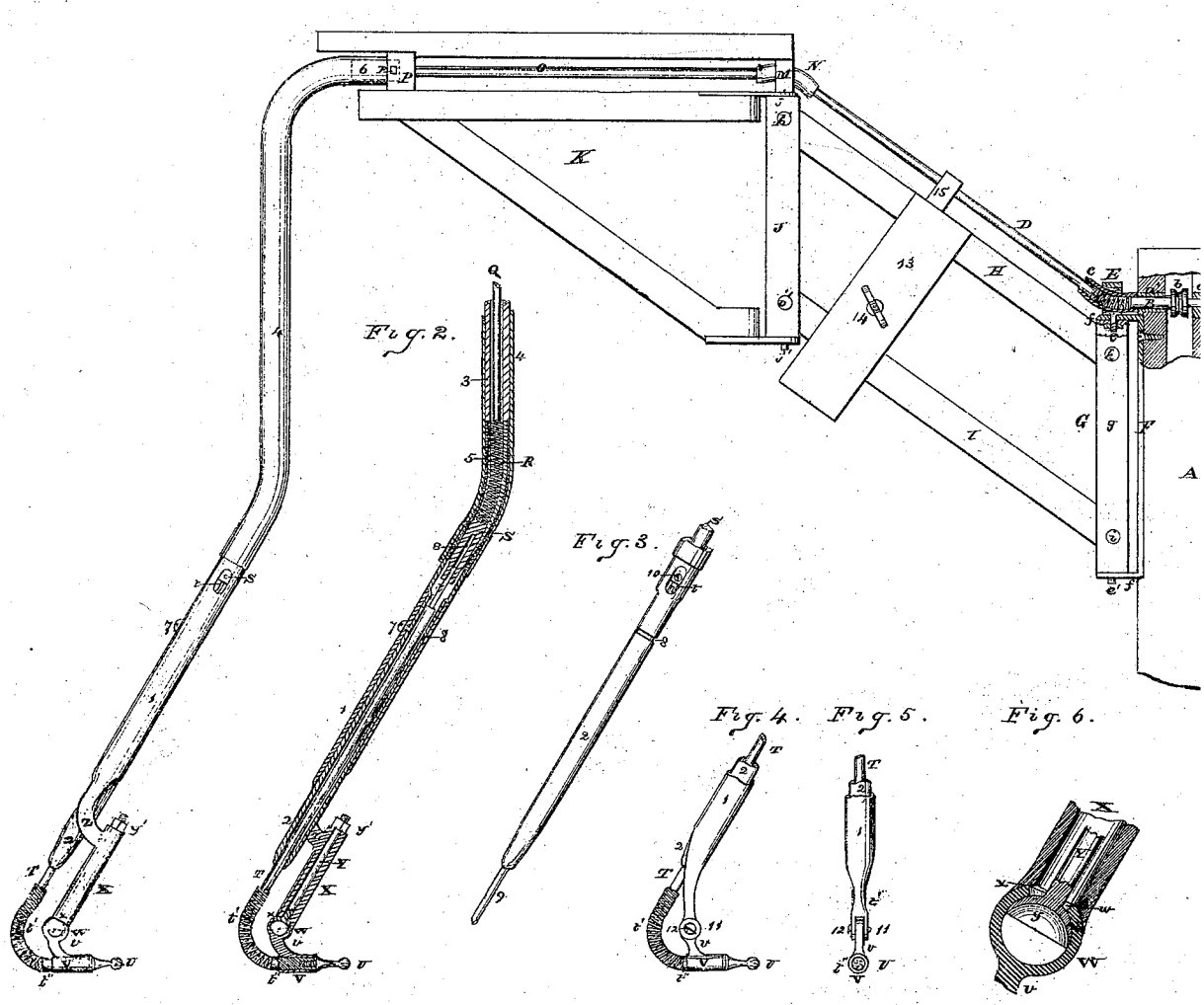

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

Witnesses:

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Attest

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JAMES B. MORRISON, OF ST. LOUIS, MISSOURI.

IMPROVEMENT IN FLEXIBLE SHAFTS.

Specification forming part of Letters Patent No. **106,498**, dated August 16, 1870.

To all whom it may concern:

Be it known that I, JAMES B. MORRISON, of St. Louis, in the county of St. Louis and State of Missouri, have invented a certain new and useful Flexible Power-Conveyer, for dental and other purposes, of which the following is a specification:

The first part of my invention consists in the construction of a flexible shaft, by which motion is conveyed from a stationary revolving shaft or head to a drill, burr, or other tool, enabling the tool to be applied to any object within its range; and in the construction of the sleeve enveloping the outer portion of the flexible shaft, and extending a greater or less distance toward the fixed end of said shaft, the sleeve giving journal-bearing to the inclosed part of the shaft and to the tool in most cases.

The second part of my invention consists in an adjustable head or socket, which gives journal-bearing to a tool, the head being connected, by a universal or common hinge, to a sleeve, which envelops the extremity of the sleeve before mentioned, and admits of turning thereupon, so that the tool can be adjusted to any desired angle with the sleeve, and the latter may be freely turned when in use.

The third part of my invention consists in the combination, with the said flexible shaft, of a parallel bracket, which admits of swinging to the right or left, of vertical adjustment, or of extension or contraction, the tray being supported upon the bracket, and retaining its horizontality during all these movements.

Figure 1 is a side elevation of my improved apparatus as applied to dentists' use, a portion being in section to exhibit the construction of the flexible joints and the double hinge of the bracket. Fig. 2 shows the end portion of the flexible shaft in axial section. Fig. 3 is a side view of the metallic tube constituting the outer section of the sleeve, and giving journal-bearing to a straight drill, as shown in this figure, or to a section of the flexible shaft, as shown in Figs. 1 and 2. Fig. 4 is a side view of a simpler form of hinge than that shown in Figs. 1, 2, and 6. Fig. 5 shows such hinge viewed at right angles to Fig. 4. Fig. 6 is an enlarged view of the hinge shown in Figs. 1 and 2.

A is a portion of the stand or case giving journal-bearing *a a'* to the shaft B of a pulley, *b*. The shaft B connects, by a wire spiral or helix, C, to a section of shaft, D, the said helix being shown enveloped in a short piece of india-rubber pipe, *c*, which allows the free flexure of the helix. This universal joint C *c* turns in a swivel-eye, E. The pivot *e* of the swivel forms the pintle of the upper part of the hinge, by which the adjustable bracket is connected to the stand A. The pintle *e* passes vertically through the ear *f* of a plate, F, attached to the side of the stand A. The pintle *e* also passes through the top of the strap G, which is stepped by a pintle, *e'*, in the ear *f'*. The strap G consists of two perpendicular bars, *g*, connected at top and bottom where the strap is pivoted to the ears *f f'*. The parallel bars H I are pivoted to the strap G by pivots *h i*, which pass through sides *g* of the strap, and through the said bars. These bars are also pivoted in like manner to the strap J by the pivots *h' i'*. The strap J has pivoted to it, by pivots or pintles *j j'*, a bracket, K, supporting the instrument-tray L. The pintle at the upper end of the strap J forms also the pintle of the swivel-eye M, which is similar to that E, and gives journal-bearing to a universal joint, N, similar to C *c*. The joint N is attached to a shaft, O, which turns in a box, P, and which, after passing through the box, is attached, by a spiral helix similar to C, to another section of shaft, Q, Fig. 2. By a similar helix, R, the shaft-section Q is attached to the socket-head S. The socket *s* (see Fig. 2) of the head S is square, and receives the square end *t* of the shaft-section T. The shaft T ends in a helix, *t'*, to which is attached a socket-head, *t''*, into which screws the drilling-tool U, which may consist of a burr, as shown, a common drill, or other tool. The socket *t''* turns in a tubular box, V, having an arm, *v*, ending in a hollow ball, W, adjustable in a socket, *x*. The ball has a circular opening, *w*, Fig. 6, on the side opposite to the arm *v*, and through the opening passes a screw-bolt, Y, having a hemispherical head, *y*, whose convex side is made to press against the inner side of the ball to render the joint rigid. The rod Y traverses the tube X, and receives a nut, *y'*, by turning which the head *y* is forced against the interior of the ball W, and makes the joint rigid. The tube X is

connected, by a bifurcated arm, Z, to a sleeve, 1, which turns at will upon the tube 2, in which the shaft T and head S have journal-bearing. The shaft Q turns in a section of pipe, 3, and over this pipe is drawn a sleeve of india-rubber, 4, which is shown extending from the box P to the tubular box 2. The portions of the sleeve 4 covering the helices at the ends of the shaft Q are lined with helices of wire, one of which is shown at 5, in Fig. 2. These helices 5 serve to support the sleeve against exterior pressure, and yet allow flexibility to the joint. Within the end of the sleeve 4 is a section of tubing, which extends into a counter-bore of the box P, and which is held therein by a set-screw, *p*. This tube serves to connect the sleeve 4 to the fixed box P, and is shown by dotted lines at 6, Fig. 1. The sleeve 1, as before mentioned, has free rotation on the tube 2, and is held thereon by a set-screw, 7, whose joint enters a circumferential groove, 8, in the said tube 2.

In Fig. 3 the sleeve 1 is removed, and a straight drill, 9, occupies the place of the shaft-section T of Figs. 1 and 2. The drill 9 has, near its outer end, journal-bearing in the tube 2, while its inner (square) end *t* enters the socket *s*, and is held therein by a set-screw, 10. The form shown in Fig. 3 is not only the most simple, but of much more general application than that shown in Figs. 1, 2, and 4, the latter form being applicable chiefly to cases where the drilling is made from the inner side.

Figs. 4 and 5 show a simpler form of hinge than that shown in Figs. 1, 2, and 6. This simpler form is a plain rule-joint, 11, and needs no special description. It is tightened to hold the tool at the desired angle by turning up the pintle-screw 12. In this simpler form of hinge the tool may be set at any angle with the shaft T, but does not admit of being set to either side, as may be done with the universal joint shown in Fig. 6.

The bracket K, with the bearings M P of the flexible shaft, may be turned to the right or left on the vertical pivots of either of the straps G or J, or may be folded back against the stand A.

The bracket is sustained at the desired elevation by means of a clamp, 13, whose jaws are held together by means of a thumb-screw, 14, and, being rigidly attached to the upper bar H, are made to firmly grasp the bar I when drawn together by the thumb-screw. The midlength of the pivots *h i* and *h′ i′* are in the vertical lines extending from the vertical pivots *e* to *e′* and *j* to *j′*, so that the flexible shaft is undisturbed in its bearings in whatever way the bracket may be moved. The bracket may be raised or lowered without in any way affecting its horizontality, or that of the tray.

The shaft B may be turned by a belt upon the pulley *b*, or may be fitted with a crank having connection with a treadle.

One or more bearings, as in 15, Fig. 1, may be given to the cylindrical sections of the shaft, or the shaft may be supported wholly by bearings supporting these sections, the bearings embracing the flexible portions being dispensed with.

In some cases it may be desirable to extend the sleeve 4 so as to envelop the whole length of the flexible shaft from the box *a′* to the tubular pipe or box 2 at the free end of said shaft.

I claim as my invention—

1. The sleeve 2 3 4 5, enveloping more or less of the flexible shaft, and giving journal-bearing to more or less of said shaft, and to the tool, as set forth.

2. In combination with the flexible shaft, the joint W *w* X *x* Y *y y′* or 11, as described.

3. The combination of the flexible shaft with the adjustable bracket supported, substantially as stated, by parallel bars H I, held in position by a clamp, 13, operated by a set or thumb screw, 14, or its equivalent.

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Witnesses:
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