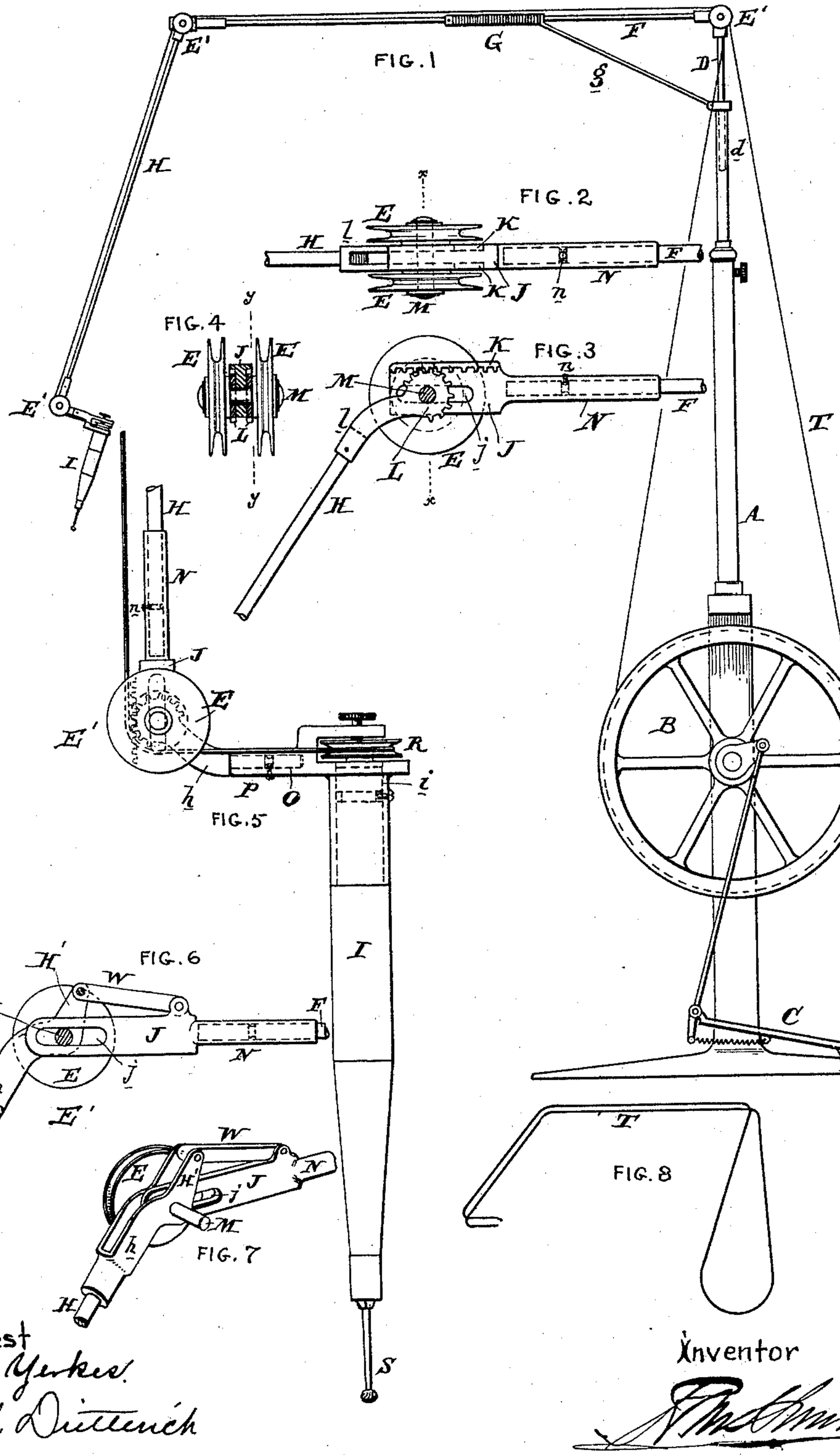
(No Model.)

R. M. HUNTER.

DENTAL ENGINE.

No. 476,944. Patented June 14, 1892.



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DENTAL ENGINE.

SPECIFICATION forming part of Letters Patent No. 476,914, dated June 14, 1892.

Application filed February 12, 1892. Serial No. 421,249. (No model.)

To all whom it may concern:

Be it known that I, RUDOLPH M. HUNTER, of the city and county of Philadelphia, and State of Pennsylvania, have invented an Improvement in Dental Engines, of which the following is a specification.

My invention has reference to dental engines; and it consists of certain improvements, which are fully set forth in the following specification and shown in the accompanying drawings, which form a part thereof.

This specification (Case No. 216) has particular reference to improvements in dental engines wherein there is automatic compensation in the length of the flexible arm to compensate for the varying amount of the endless driving-cord taken up in passing about the circumferences of the guide-pulleys under various conditions of flexing or moving of the arm.

The object of my invention is to so construct the parts that the cord shall transmit power to the handpiece without the requirement of heavy tension or material variations in the tension. The advantage of this is that the operator is not so readily fatigued and is permitted to handle the instrument with more ease and accuracy; and, furthermore, the operation on the patient is more satisfactory, first, because the power transmitted is uniform for all movements of the arm, and, secondly, the operation, without excessive tension on the band, permits the cord to slip in case the bore or tool should become jammed in a cavity in the tooth, thus preventing breakage.

In carrying out my invention I provide the upright of the dental engine with a flexible arm formed of several sections substantially of the well-known appearance, but differing therefrom in the joints whereby the particular method of compensation is obtained and insured.

An important feature of my invention lies in securing near the end most distant from the handpiece of any member of the flexible arm the guide-pulleys and connecting the end of said arm to the end of the next or adjacent member at its end nearest to the handpiece by a fulcrum connection at a distance from the axis of the pulleys. In this manner the movement of the handpiece directly moves the guide-pulleys of one member of the flexible arm toward the guide-pulleys at the distant end of the next member, thus insuring an absolute and positive compensation for all movements of these arms. The usual pivot construction, whereby one member of the flexible arm may revolve freely about the next member as an axis, is employed to permit the absolute universal movement of the handpiece which is necessary.

Referring to the drawings, Figure 1 is an elevation of a dental engine embodying my improvements. Fig. 2 is a plan view of the elbow-joint. Fig. 3 is a sectional elevation of same, taken on line *y y* of Fig. 4. Fig. 4 is a cross-section of same on line *x x* of Figs. 2 and 3, but with the pulleys in elevation. Fig. 5 is an enlarged view of the wrist-joint and handpiece. Fig. 6 is an elevation of a modification of the joint with one of the groove-pulleys removed. Fig. 7 is a perspective view of same, and Fig. 8 is a perspective view showing the endless band.

A is the upright or standard and carries near its lower part the grooved driving-wheel B, which is operated by the usual crank-and-treadle movement C. Secured to the upper part of the standard A is an upright D, which is socketed at *d*, so that it and the flexible arm may swing freely about the standard A as a vertical axis.

F is the horizontal arm and is jointed to the upright D by the joint E′. It is held in a substantially horizontal position by means of the strut *g* and the spring G. This will permit variations in its angle with the upright D and also substantially counterbalance it, whereby it is normally held horizontally, or approximately so.

H is the forearm and is jointed to the horizontal arm F by a joint preferably similar to the joint at the top of the upright D.

I is the handpiece and is connected with the forearm H by the joint E′, similar to the connection between the forearm and the horizontal part of the arm. These various joints E′ are clearly shown in Figs. 2 to 5, inclusive. All the letters upon Figs. 2, 3, and 4 correspond to the joint between the arms H and F. The end of the arm F is provided with a socketed piece N, which is free to revolve about F as a

longitudinal axis, but is prevented from coming off the same by a groove and screw *n*. This piece N is provided with a flat head J, having a longitudinal slot *j* and a rack K upon each side at a distance from the slot and parallel, or substantially so, with respect to it. The end of the arm H is provided with a forked head *l*, the ends of which are furnished with teeth to form pinions L, which mesh with the teeth of the racks K. The parts are held together by a hinge-pin M, passing through the centers of the pinions L and the slots *j*, the head J being received between the two pinions. Upon each side of the joint and journaled upon the transverse hinge-pin M are the grooved pulleys E. With my construction the diameters of these pulleys may be made large, so as to reduce as much as possible the power required to cause them to rotate freely. This is permitted because I employ a positive compensating device of such a character that as the outer arm of any two adjacent arms is moved it positively compensates for the increased or decreased amount of cord wrapped about the circumference of the pulley. This is not accomplished by any other dental engine employing only two grooved guide-wheels at the joints, although I am aware that attempts have been made to accomplish the same. This wrist-joint E′ is constructed on the same principle as the elbow-joint between the parts H and F, as indicated in dotted lines in Fig. 5. The details of this joint are shown in Figs. 2, 3, and 4.

It will be observed that if the arm F is stationary and the arm H be moved to the right the pinion L will travel along the rack K to the right, and the axis M of the pulleys will also move to the right to compensate for the greater amount of cord which is necessarily wrapped about the pulleys. This same action takes place at the top of the standard and at the wrist-joint, the constructions being substantially the same in all of these parts. It is possible, however, to dispense with the use of a compensating joint at the top of the standard, because the arm F is seldom moved up or down out of a horizontal position or such position at which it is set to any appreciable extent. In this case deeply-grooved pulleys might be employed.

I is the handpiece, which carries the burr or tool S in any suitable chuck. The handpiece I is sleeved in a tubular part *i*, secured to the head P, which is of itself sleeved at right angles to the spindle of the handpiece by a joint O on the head *h* of the wrist-joint precisely as the joint N is employed between the parts F and H and H and *h*. The spindle of the handpiece is not shown, but may be of any preferred or suitable construction, terminating in the chuck at the bottom for holding the burr or tool S and provided at the upper part with the deeply-grooved driven wheel R.

T is the band, which is made endless and passes from the driving-wheel B over the several guide-pulleys E to the driven pulley R, as indicated in Figs. 1, 5, and 8. It will be seen that the handpiece may swing upon a joint between the parts J and *h* (back of the pulleys E, Fig. 5) and may also revolve about a vertical axis at N upon the forearm H and a horizontal axis at O between the head P and the parts *h* of the wrist-joint. If the wrist-joint be bent so as to require more of the cord to be wrapped about the guide-pulleys at the joint, the said guide-pulleys would be moved by the handpiece so that its axis would come nearer to the axis of the guide-pulley at the other end of the said forearm, thus compensating for the extra cord wrapped about the guide-pulleys, or vice versa. These several joints permit the handpiece to be moved in any conceivable direction without the least binding, and, furthermore, the rack-and-pinion construction itself acts as stops to limit the flexing of the arm when it has reached such a point that further movement would tend to disengage the cord from the pulleys.

In place of the rack-and-pinion joints shown in Figs. 2, 3, and 4 the joints shown in Figs. 6 and 7 may be employed. In this case the forked head *h* of the forearm H is extended upward, as at H′, corresponding to one tooth of the pinion, and this extension is connected by a link W with the head J. The transverse pin or axis M is carried by the head *h* and works through the slot *j* of the head J, as before, and the pulleys E are arranged upon each side of the head *h* and upon the transverse pin M. As the arm H is moved inward the pulleys are moved nearer toward the right-hand end of the slot and compensate, as heretofore described, for the varying length of cord brought into contact with the peripheries of the pulleys.

I do not confine myself to the mere details of construction, as they can be modified in various ways without departing from my invention.

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

1. In a dental engine, a joint for the flexible arm for guiding the band, consisting of two members hinged together and having a transverse pin adjustable upon one member and movable with the other, in combination with guide-pulleys upon the transverse pin, about which the cord passes.

2. In a dental engine, a jointed or flexible arm consisting of two members, one of which is slotted in the direction of its length and the other of which is provided with a transverse pin movable in the slot of the other member and in which both members are loosely connected or fulcrumed at a point transversely to the slot, in combination with guide-pulleys upon the transverse pin, about which the cord passes.

3. In a dental engine, the combination of an arm adjacent to the standard, having at its free end a longitudinal guide, a second arm connecting with the free end of the first-men-

tioned arm by a transverse pin working in said guide and also movably connected to said first-mentioned arm at a point to one side of the guide, grooved guide-pulleys on the transverse pin, a handpiece supported by the free end of the second-mentioned arm, having a grooved driven pulley, and an endless band leading from the main drive-wheel of the standard about the guide-pulleys to the driven pulley on the handpiece.

4. In a dental engine, a jointed or flexible arm consisting of two members, one of which is slotted in the direction of its length and the other of which is provided with a transverse pin movable in the slot of the other member and in which both members are loosely connected or fulcrumed at a point transversely to the slot by a rack-and-pinion connection, in combination with guide-pulleys upon the transverse pin, about which the cord passes.

5. In a dental engine, a standard provided with a driving-wheel and treadle motion, in combination with a flexible compensating arm connected at one end to the top of the standard, a handpiece connected to the other end of the flexible arm and having a grooved driven pulley, guide-pulleys at the joints of the arms, and an endless drive cord or band extending from the driven wheel to the drive-wheel and passing about the guide-pulleys, and in which the several members of the flexible arm have their ends nearest the handpiece formed with longitudinal guides and are movably connected with the adjacent members at one side of said guides and in which the several members of the flexible arm at a distance from their ends farthest from the handpiece are provided with transverse pins carrying the grooved guide-pulleys and guided in the guides on the ends of the adjacent members.

6. In a dental engine, the combination of the vertical standard and drive-wheel with the horizontal member of the flexible arm, hinged to the top of the standard and provided at the juncture with guide-pulleys, the forearm or second member of the flexible arm hingedly connected to the horizontal member, grooved guide-pulleys carried on the forearm or second member of the flexible arm at a short distance from the fulcrum point or connection with the horizontal member, a handpiece having a grooved driven pulley supported from the free end of the forearm or second member, and an endless band extending from the drive-wheel to the driven pulley of the handpiece and guided about the guide-pulleys.

7. In a dental engine, the combination of the vertical standard and drive-wheel with the horizontal member of the flexible arm, hinged to the top of the standard and provided at the juncture with guide-pulleys, the forearm or second member of the flexible arm hingedly connected to the horizontal member and movable about said member as an axis, grooved guide-pulleys carried on the forearm or second member of the flexible arm at a distance from the fulcrum point or connection, a handpiece having a grooved driven pulley supported from the free end of the forearm or second member, with provision for universal movement, and an endless band extending from the driven wheel to the driven pulley of the handpiece and guided about the guide-pulleys.

8. In a dental engine, a flexible arm consisting of several members, combined with a handpiece having a grooved driven wheel connected to said arm by a universal joint consisting of a part pivoted upon the end of the forearm and hinged to the member of said flexible arm directly connected with the handpiece, guide-pulleys carried upon the member directly connected with the handpiece at a distance from its fulcrum-point and nearer to the handpiece, and a band passing about the guide-pulleys and driven wheel of the handpiece.

9. In a dental engine, a standard, combined with a grooved driving-wheel and treadle motion, a flexible arm consisting of several members jointed together and connected at one end to the top of the standard and at the other to the handpiece, grooved guide-pulleys upon each member of the flexible arm near one of its ends, but slightly removed from the joints, a handpiece having a deeply-grooved driven pulley, and an endless band passing from the driven wheel about the guide-pulleys to the driven pulley on the handpiece.

In testimony of which invention I have hereunto set my hand.

R. M. HUNTER.

Witnesses:
ERNEST HOWARD HUNTER,
S. T. YERKES.