R. B. DONALDSON.

Hand-Piece for Dental-Engines.

No. 222,181. Patented Dec. 2, 1879.

Fig. 1.

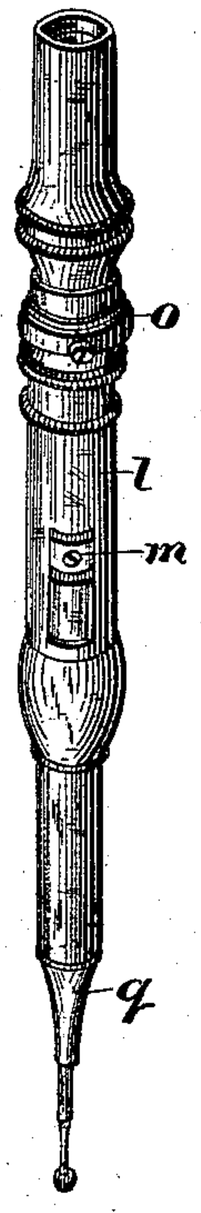

Fig. 2.

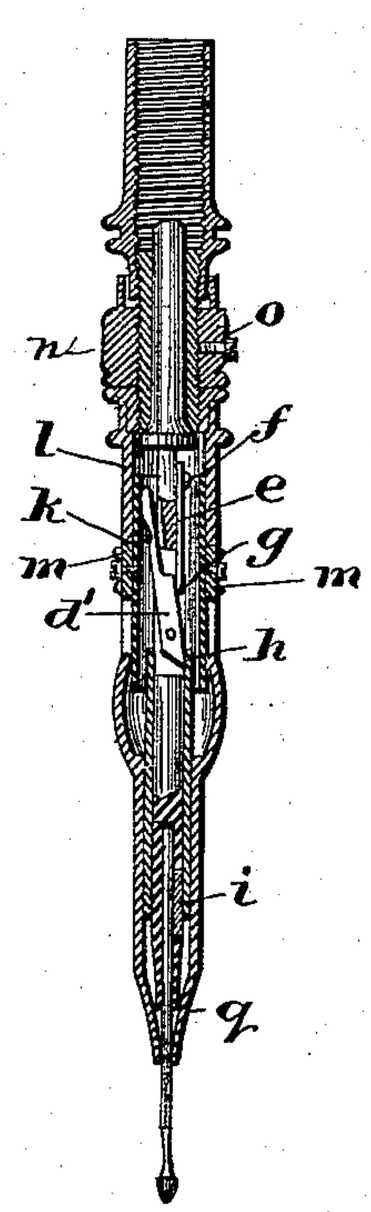

Fig. 3.

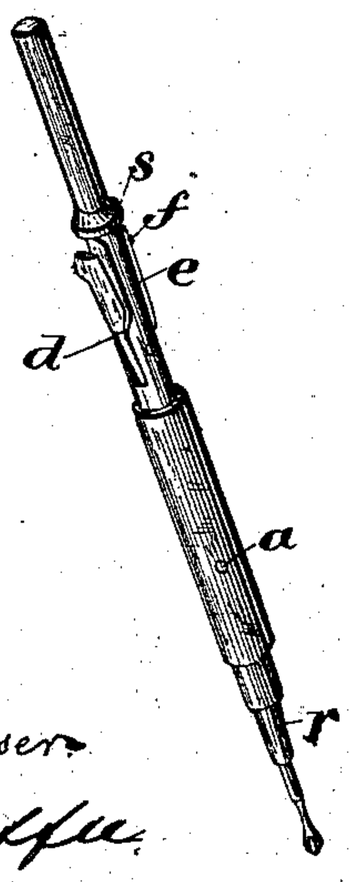

Fig. 4.

Fig. 6.

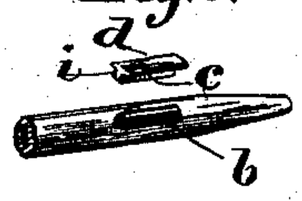

Fig. 5.

Fig 8

Fig. 7.

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ROBERT B. DONALDSON, OF WASHINGTON, DISTRICT OF COLUMBIA.

IMPROVEMENT IN HAND-PIECES FOR DENTAL ENGINES.

Specification forming part of Letters Patent No. **222,181**, dated December 2, 1879; application filed October 24, 1879.

To all whom it may concern:

Be it known that I, ROBERT B. DONALDSON, of Washington, District of Columbia, have invented new and useful Improvements in Hand-Pieces for Dental Engines, of which the following is a specification.

One object of my invention is to furnish an improved hand-piece, adapted to secure firmly tools having smooth round shanks, and admit of their ready and convenient removal from the rotating mandrel or chuck of the hand-piece by the operator.

Another object is to provide a simple and effective means whereby the wear of the bearings upon which the mandrel or chuck revolves can be taken up or compensated for, so that the chuck can always be kept so as to run freely and steadily, however much the bearings may be worn by friction.

The accompanying drawings will show the different parts and their application comprising my invention.

Figure 1 represents an external view of the hand-piece as improved by me when ready for attachment to the dental engine. Fig. 2 represents a longitudinal central section of the same. Fig. 3 represents a view of the revolving mandrel or tool-chuck, which is socketed at one end, as usual, for the reception of the round shank of the operating-tool, and properly formed at the other end for attachment to the flexible cable or driving-shaft of the dental engine, which is to operate it. Figs. 4, 5, 6, 7, and 8 represent detail parts to be hereinafter referred to and explained.

To enable the operator to secure the operating-tool quickly, easily, yet firmly, in the socket of the chuck or mandrel of the hand-piece and remove it with equal facility, in order to substitute a different tool while operating upon the teeth, has always been among the most important of the many considerations involved in the construction and use of dental engines. Many different devices have been invented and patented for this particular purpose, but, with few exceptions, these tool-locking devices have required a lug, a notch, or some other peculiarity of construction at the end of the tool-shank, which would prevent the tools being used in any other hand-piece than the one provided with a lock or catch specially adapted to their peculiar formation. Thus dentists who use the hand-piece of one manufacturer cannot use the burrs, drills, and other engine-instruments of other manufacturers, because of their shanks being shaped differently. The diameter and length of the shank are, however, the same in the instruments of all these different manufacturers. It is, therefore, very desirable to have a hand-piece in which the instruments of any or all of them can be used. This can be accomplished only by having a clamp or clutch which will secure firmly a plain round shank in the socket of the chuck or mandrel of the hand-piece. Two or three devices of more or less value have already been invented and patented for this purpose, but differing radically from my invention, which involves what I believe to be the application of a new principle in this connection.

By taking advantage of lever-power, which has never before, to my knowledge, been used in this connection, I am enabled to bring a powerful pressure to bear upon the plain round shank of the operating-tool when within the socket, thus securing it so firmly therein as to resist any force which in practical use would tend to loosen or withdraw it.

In order to overcome the difficulty which would be experienced from the springing or yielding of a solid lever of the length and limited thickness necessary in this connection, I make use of a tube or sleeve to subserve the purposes of a lever. This possesses the advantages of being thin and light, occupies but little space, and yet is, when properly tempered, very strong and unyielding, giving the positive pressure required. This tube-lever (a separate view of which is given in Fig. 5) surrounds, and is pivoted upon, the chuck or mandrel, the chuck being enough reduced in size in each direction from the point *a*, Fig. 3, where the pivot is inserted, to allow a free movement in the direction, and for the space required, of the long and short ends of the lever.

The clamp *i*, Fig. 6, is made of steel and hardened, and is fitted so as to move freely in a longitudinal slot in the chuck or mandrel. (Shown at *b*, Fig. 6.)

The side *c* of the clamp which is intended to embrace the tool-shank is grooved to fit the round of the shank. The opposite side, *d*, is rounded to conform to the inner surface of the tube-lever, the short end of which lever presses upon it, forcing the clamp firmly against the tool-shank when in operation. The long end of the tube-lever is acted upon by the short end of a smaller lever, *d'*, Fig. 3, which is fitted to and pivoted in a longitudinal slot, made through the rear end of the chuck or mandrel, the lever moving freely upon the pivot. This small lever is operated by a spring, *e*, which is screwed or riveted to the chuck or mandrel at the point *f*, the free end of the spring bearing upon the lever *d'* at the point *g*, thus causing the short end of said lever to press upon the inner surface of the long end of the main or tube lever at *h*, forcing this end of the tube-lever in a direction away from the body of the mandrel, and, as a necessary consequence, forcing the opposite or short end down upon the clamp *i*.

For the purpose of removing the tool which has been clamped, the long end of the lever *d'* is inclined or raised from the mandrel on the side opposite to that upon which the spring bears, when all the several parts are in position. This inclined end is operated upon by a steel thimble, *k*, which is fitted to and slides freely upon the inner surface of the outside casing, *l*. This steel thimble is moved forward or backward by means of two finger-pieces, *m m*, (the external surfaces of which are roughened,) which are screwed fast to the outer surface of the thimble *k*, and move in longitudinal slots cut through the outer case, *l*. When moved backward by pressure upon these finger-pieces the inner surface or bore of the thimble (which is slightly rounded from within outward at the end) impinges upon the inclined end of the lever *d'*, pressing it down toward the chuck or mandrel, thus relieving the pressure of the short end of this lever upon the main or tube lever, and, as a necessary consequence, relieving at the same time the pressure of this main lever upon the clamp confining the tool in the socket of the chuck.

By this double-lever arrangement but little force is necessary to relieve the tool, notwithstanding the power with which it has been clamped, a very slight pressure upon the finger-pieces being all that is required to loosen the tool in the socket. A reverse motion of the finger-pieces will, of course, allow the spring to act normally upon the lever and again clamp the tool.

The tube surrounding the mandrel and pivoted thereon to serve as a lever, I consider the most important part of my invention; and while there are some advantages derived from the employment of an additional lever in connection therewith, it is evident that other means may be employed to operate the tube-lever if the use of the shorter lever be dispensed with. For example, the long end of the tube-lever may be operated upon directly by a spring without the intervention of an additional lever; and this spring could be so constructed that the sliding thimble *k*, when moved back, would press directly upon it, and thus relieve the pressure upon the tube-lever when the tube is to be removed. Or a spiral spring surrounding the rear portion of the mandrel could be used to force under one side of the long end of the tube-lever a properly-constructed thimble, (one side being inclined,) thus forcing the short end of said lever down upon the clamp.

The second part of my invention consists of a sliding collar, a separate view of which is given in Fig. 4, which is fitted to and moves easily upon the outside of the rear end of the hand-piece to which the casing is attached, and furnished with a set-screw, *o*, by means of which it can be secured firmly in any desired position within the range of its movement. The front end of the collar forms the shoulder, against which the outside case is screwed when the parts are in position, and it is intended to regulate or adjust the chuck or mandrel when it has become too loose from the wear upon its bearings.

Fig. 8 represents a view of the rear portion of the hand-piece provided with a screw portion, *p*, to which the outer casing is intended to be attached by an inside or female screw, and showing the regulating-collar *n* in position.

In my hand-piece the screw portion *p* is made a little longer than in the ordinary hand-pieces, and is bored, as usual, for the reception of the reduced end of the chuck or mandrel to which the flexible cable or driving-shaft is attached. The shoulder of the mandrel (shown at *s*, Fig. 3) bears upon the end of this screw, which thus forms one of the bearings upon which the mandrel revolves. The other bearing is within and against the steel nib *q*, the bore of which is conformed to the slightly-tapering end of the mandrel, as shown at *r*. This steel nib, which is attached to and forms a part of the outside case, extends a little beyond the socketed end of the mandrel which revolves within it, so that the oil with which the bearings are lubricated may not work out upon the exterior of the nib or upon the exposed portion of the tool-shank.

To adjust the mandrel or chuck when it has become too loose from the wear caused by friction, the set-screw *o* is loosened and the adjusting-collar (which covers and slides over a portion of the screw *p*) is moved back, so as to allow the screw *p* to enter the case a little farther than it did before, thus shortening the distance between the bearings and compensating for the wear upon them. By this means the chuck or mandrel can, in a few moments and without taking the case apart, be adjusted readily and perfectly, and can be kept so as to run true, however much it may have become worn by long usage.

I am aware that the use of a movable adjusting-collar, in connection with other parts of a dental hand-piece, is not new, and therefore I do not broadly claim the combination of an adjustable collar with the other mechanism of a hand-piece; but I believe myself to be the first to apply and combine a movable adjusting-collar with a set-screw inserted in it and arranged to press upon a flattened surface of the rear section of the hand-piece, thus holding the collar more securely in position and with less liability to be accidentally moved than by those methods of construction heretofore in use; and it is to this particular combination of the set-screw inserted in the adjustable collar and acting upon a flattened surface of the rear portion of the hand-piece, as above set forth, that my invention and claim are limited.

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

1. In the hand-piece of a dental engine, a tube surrounding and being pivoted to the tool-chuck or mandrel to serve as a lever and bearing at the short end on the tool-clamp, the long end being operated by another lever actuated by a spring or by other suitable means, substantially as hereinbefore set forth and described.

2. In the hand-piece of a dental engine, the tube or sleeve pivoted and serving as a lever, in combination with an additional lever and sliding thimble for operating the same, substantially as hereinbefore set forth.

3. In the hand-piece of a dental engine, the combination of the tool-clamp, the tube-lever, the small lever operated by a spring and having an inclined end, and the thimble having finger-pieces attached and movable in slots in the outside case, substantially as hereinbefore set forth.

4. In the hand-piece of a dental engine, the combination of the mandrel or tool-chuck having one bearing against the screw in the rear portion of the hand-piece, and the other in the nib or end portion of the outer case, and the sliding collar with a set or lock screw passing through it and acting upon the flattened surface of the rear section of the hand-piece to secure the collar in position for adjusting the mandrel when the bearings have become worn by friction, substantially as hereinbefore set forth.

ROBERT B. DONALDSON.

Witnesses:
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M. F. THOMPSON.