(No Model.)

# A. J. HARRIS.

## DENTAL PLUGGER.

No. 477,411. Patented June 21, 1892.

Fig. 1.

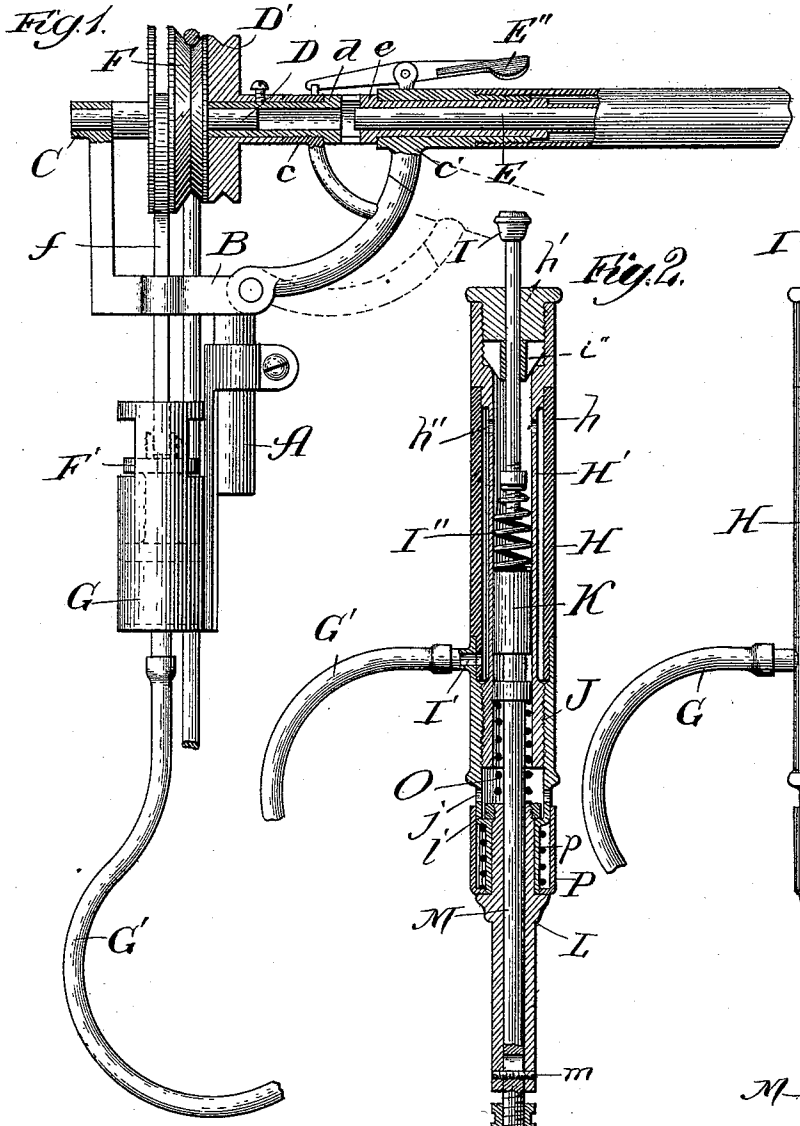
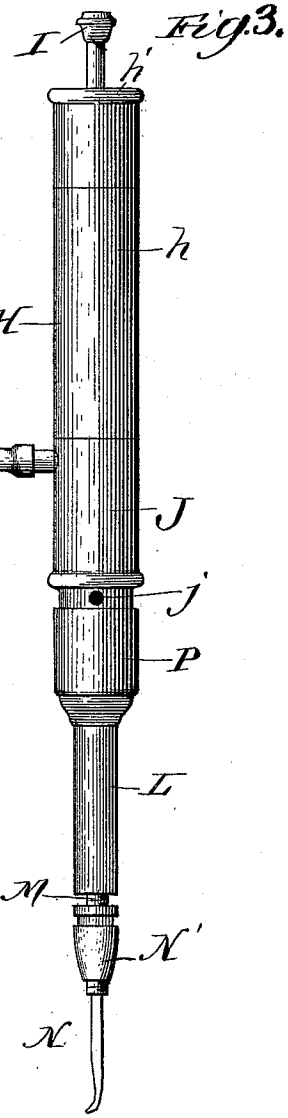



Fig. 2.




Fig. 3.

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# UNITED STATES PATENT OFFICE.

ANDREW J. HARRIS, OF CHICAGO, ILLINOIS.

## DENTAL PLUGGER.

SPECIFICATION forming part of Letters Patent No. 477,411, dated June 21, 1892.

Original application filed May 5, 1891, Serial No. 391,641. Divided and this application filed July 16, 1891. Serial No. 399,717.

(No model.)

*To all whom it may concern:*

Be it known that I, ANDREW J. HARRIS, a citizen of the United States, residing at Chicago, Cook county, Illinois, have invented certain new and useful Improvements in Dental Pluggers, for which I made application May 5, 1891, Serial No. 391,641, and of which the following is a divisional specification.

As is well known, these pluggers are used in dentistry for various purposes, as for hammering in fillings, breaking away parts of the teeth, &c. The objection to a plugger operated by hand is that it is almost impossible to get a series of blows of uniform weight or force, and accordingly pluggers operated by pneumatic power have been used for this purpose. The objections to pneumatic pluggers have thus far been that it is difficult to accurately gage and control the force of the blows which are to be struck and that the instrument is too large and cumbrous to easily handle. These objections it is the object of my invention to obviate, and in carrying out my invention I provide a pneumatic plugger capable of being perfectly controlled, simple and efficient in operation, and light and easy to handle; and the invention consists in the features and details of construction hereinafter described and claimed.

In the drawings, Figure 1 is a vertical elevation, partly in section, of the operating machinery; Fig. 2, a central longitudinal cross-section of the handpiece, and Fig. 3 a vertical elevation thereof.

A suitable operating stand and wheel (not shown) are provided for operating the mechanism. To this stand is attached by any suitable means, as by a socket A, a frame or casting B, provided with bearings C *c c'*. A shaft D is supported at one end in the bearing C, while its other end fits into a hollow shaft or sleeve *d*, supported in the bearing *c* and carrying a pulley D'. The shaft E is connected with the ordinary drill, and to this shaft is secured a sleeve *e*, which engages, by means of a suitable clutch, with the sleeve *d*, whereby the motion of the pulley D' is communicated to the shaft E, a spring-catch E'' being provided to hold the parts in engagement. On the shaft D is mounted another pulley F, to which is attached a piston-rod *f*, connected to a piston F', which travels up and down in a cylinder G, preferably attached to the frame-work B. This piston may be made double or single, as desired. The lower end of this cylinder is connected by means of a pipe G', preferably made of rubber or other elastic material, with the plugger H. The plugger consists of an outer shell or casing *h*, made of hard rubber or other suitable material, and an inner shell or cylinder H', preferably made of metal. This inner cylinder is closed by a screw-plug *h'*, through which plug passes a rod I, which is intended to be operated for the purpose hereinafter described. The external diameter of the cylinder H' is less than the internal diameter of the casing *h*, so that an annular passage or channel is formed between them, as shown in Fig. 2, this passage communicating with the interior of the cylinder through orifices *h''*. As will be noted, the upper end of the cylinder H' is of greater diameter than the body thereof, and is provided with a shoulder against which the outer casing closely fits. I next construct out of any suitable material a shell J, internally screw-threaded, into which screws the lower end of the cylinder H', which, as shown, extends out through the end of the casing *h*. This shell J also receives the lower end of the casing *h*, and when these parts are all put together in the manner shown air-tight joints will be formed between them, and there will be no communication between the annular passage and the interior of the cylinder H' other than that through the ports or orifices *h''*, nor will there be any opening into this annular passage except the opening I', to which the hose or tube G' is connected, as shown. The interior of the cylinder communicates with the outer air through openings *j*, which serve to permit air to enter the cylinder and escape therefrom when the device is operated, as hereinafter described. Within the cylinder slides the mallet K, made of any suitable material and of any desired weight and adapted to fit closely within the cylinder.

Into the lower end of the shell J is inserted a tube L, provided with an annular shoulder abutting against the end of the shell J, the tube being held in place by means of a nut *l'*. The tube is held by the nut, however, in such

manner that, while it cannot be removed from the shell J, it can be freely rotated or revolved therein, so as to direct the tool carried thereby in any desired manner. Through this tube passes a spindle or bit M, which carries the instrument being used while operating. The outer end of this spindle is provided with a socket and is preferably split or separated for some distance from the end to enable it to be compressed upon the instrument N, which preferably screws into the socket, as shown. Over the outer end of this spindle passes a chuck N′, adapted to be screwed down upon the spindle for the purpose of compressing it and binding it against the tool. To restore this spindle and tool to their normal position when the mallet is withdrawn, I prefer to provide a spring C inside of the swiveling tube and abutting at one end against a shoulder on the tube L and at the other against a shoulder or nut on the spindle M.

In order to control the admission and escape of air through the exhaust-ports *j*, I provide a sleeve P, preferably of the form shown and of a size to slide easily upon the shell J, in which the exhaust-ports are made. A coiled spring *p* is interposed between a shoulder on the shell J and the inwardly-turned end of this sleeve to its normal position after it has been moved therefrom. If desired, the outer surface of this sleeve may be roughened to facilitate its being moved back and forth to cover or uncover the openings *j*. The tube L is preferably provided with lugs or extensions *m*, moving in a suitable slot in the bit, whereby any revolution of the bit independently of the hand-piece is prevented.

To regulate the distance which the mallet K will travel, I provide a rod I, sliding, as already stated, through the plug, which closes the end of the cylinder H′, and to the inner end of this rod I attach a spring I″ of any desired tension. This rod also passes through a collar or plug *i*″, which is beveled, as shown, on its inner end, and is split in order to enable it to be compressed. Its beveled face engages with a concaved or beveled shoulder upon the interior of the cylinder H′, which shoulder acts, as this plug is forced in by means of the plug *h*′, to compress it upon the rod I, so as to hold this rod in any position to which it is moved. When it is desired to increase the travel of the mallet, the rod is drawn out any desired distance, and when it is desired to diminish it the rod may be pushed in. The spring I″ acts as a cushion to receive the mallet when it is drawn or sucked back in the manner hereinafter described, and also aids in starting the mallet when air is admitted to move it in the other direction for a blow.

The device having been constructed and put together as above described, operates as follows: When the pulley D′ is being driven by means of the belt, the drill will be operated through the connections already described. When it is desired to operate the mallet, the belt is shifted to the pulley F. As this pulley revolves, the piston-rod F′ will be forced up and down in the cylinder G. Every time it is forced down the air in the cylinder and tube will be compressed and an impulse imparted thereto, which will be transmitted through the tube to the annular passage between the shell *h* and the cylinder H′, and entering the cylinder through the ports *h*″ will act upon the mallet K, forcing it downward, Fig. 2. The mallet being forced in this direction will strike against the inner end of the spindle M and force it and the tool outward. When the piston moves in the other direction, there will be a suction created within the cylinder which will tend to produce a vacuum in the mallet-casing, and thereby withdraw the mallet K from the spindle, which spindle, together with the tool carried thereby, will be restored to and maintained in its normal position by means of the spring O until again driven out by a new impulse consequent upon a downward motion of the piston. As the mallet moves downward it will tend to force the air that is in the cylinder out through the openings *j*, and the force and rapidity of the stroke can be controlled by regulating the size of the openings by means of the sleeve P, and if it be desired to stop the hammer this sleeve may be moved so as to entirely close these holes, the compression of the air being taken up by the elasticity of the tube G′. The smaller the holes *j* are the lighter will be the stroke, and by controlling the size of these holes and the length of travel of the mallet K, I can regulate the force of the blow with great exactness and precision. By means of the swiveling tube the bit and tool carried thereby can be easily and quickly revolved in order to direct the tool, as desired, without revolving the cylinder or other parts.

While I have described more or less specific forms, I do not intend to limit myself thereto, but contemplate the substitution of equivalents and changes in form and material whenever they may be necessary.

The operating shafts and pulleys, together with their connections, are not claimed herein, the same being the subject of my other application, Serial No. 391,641, of which this is a division.

I claim—

1. In a pneumatic dental plugger, the combination of a cylinder, a tube swiveled to the cylinder and forming part thereof, and a bit secured to the tube, whereby the bit may be revolved without turning the cylinder, substantially as described.

2. In a pneumatic dental plugger, the combination of an outer shell, a cylinder inside thereof, an annular passage between them closed at its ends, one or more orifices connecting this passage with the interior of the cylinder, a mallet sliding in the cylinder, and means for forcing air into the annular passage and cylinder and exhausting it there-

from, whereby the hammer is operated, substantially as described.

3. In a pneumatic dental plugger, the combination of an outer shell, a cylinder inside thereof, an annular passage between them closed at its ends, one or more orifices connecting the passage and the interior of the cylinder, a mallet sliding in such cylinder, a shell J, a tube closing the end of such shell, a spindle reciprocating in such tube and entering the cylinder, and means for pneumatically operating the mallet to cause it to strike upon the spindle, substantially as described.

4. In a pneumatic dental plugger, the combination of a cylinder, a screw-plug closing the end thereof, a rod sliding in such plug, and a beveled split plug mounted upon the rod bearing against a shoulder in the cylinder and compressed upon the rod by the action of the screw-plug to bind such rod and hold it until it is moved by positive force, substantially as described.

5. In a pneumatic dental plugger, the combination of an outer shell and cylinder inside thereof, an annular passage closed at its ends between the shell and cylinder, one or more orifices connecting this passage with the interior of the cylinder, means for forcing air into the passage and exhausting it therefrom to pneumatically operate the mallet, orifices for permitting the air to escape from the interior of the cylinder, and means for controlling the size of such orifices to regulate the force of the blow, substantially as described.

6. In a pneumatic dental plugger, the combination of a cylinder, a shell J, in which it is fastened, a mallet in such cylinder, means for pneumatically operating such mallet, orifices *j* for allowing the entrance and escape of air to and from the shell as the mallet moves back and forth, a sleeve P for regulating the admission of air into the orifices and controlling the blow of the mallet while in use, and a spring normally withdrawing the sleeve to uncover the orifices, substantially as described.

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