

Nov. 8, 1927.

1,648,273

F. J. HOFSCHEIDER

METHOD AND APPARATUS FOR GRINDING TEETH

Filed Jan. 5, 1924

4 Sheets-Sheet 1

Fig. 1

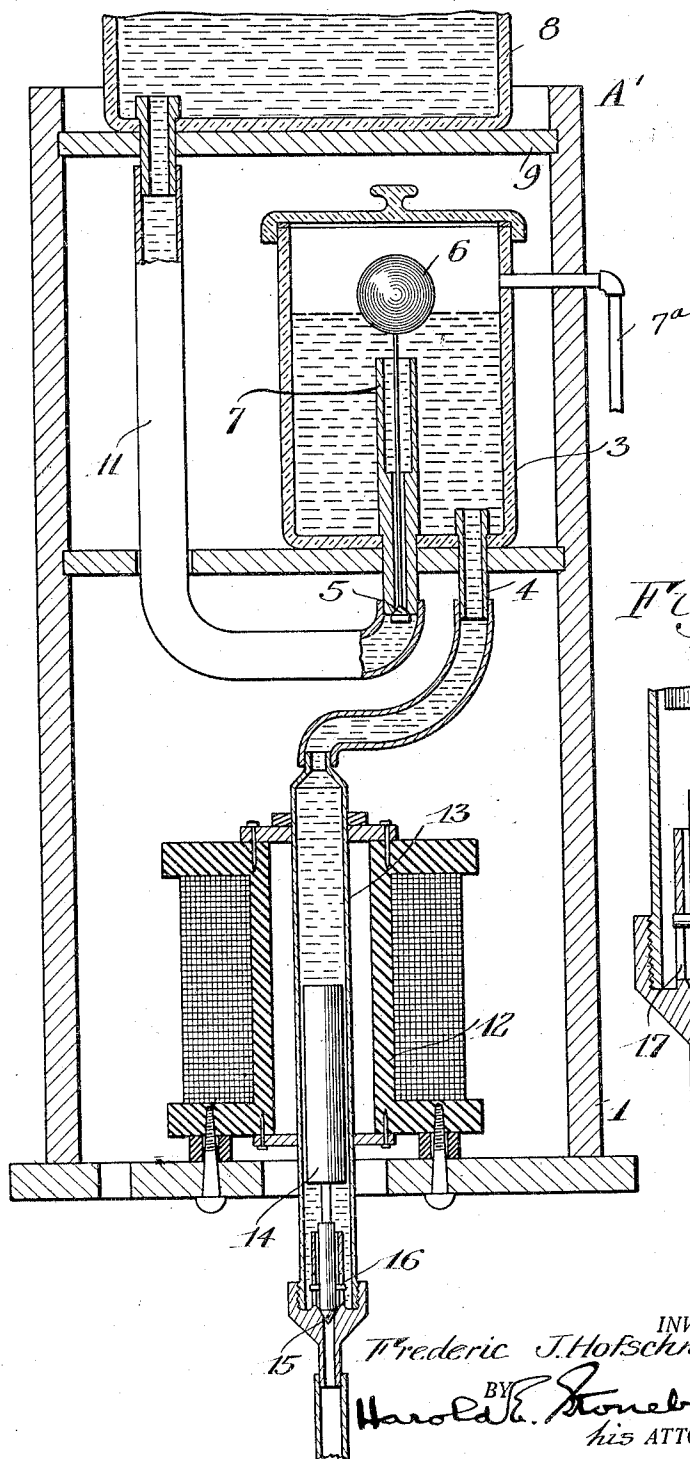
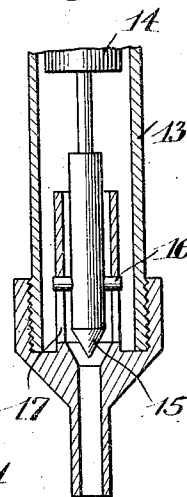


Fig. 7



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Fig. 2

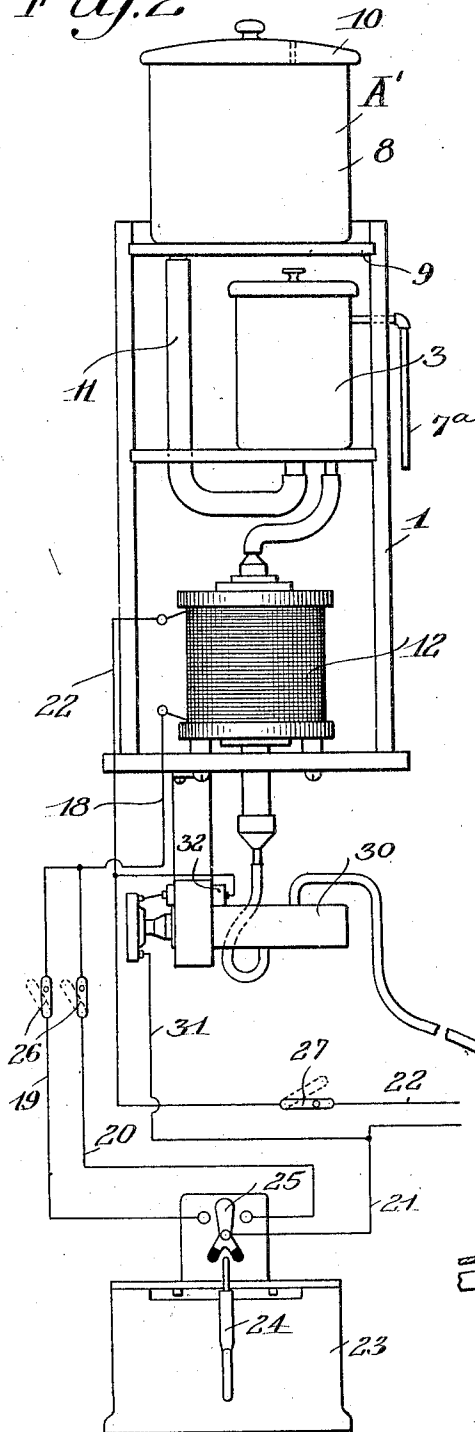


Fig. 3

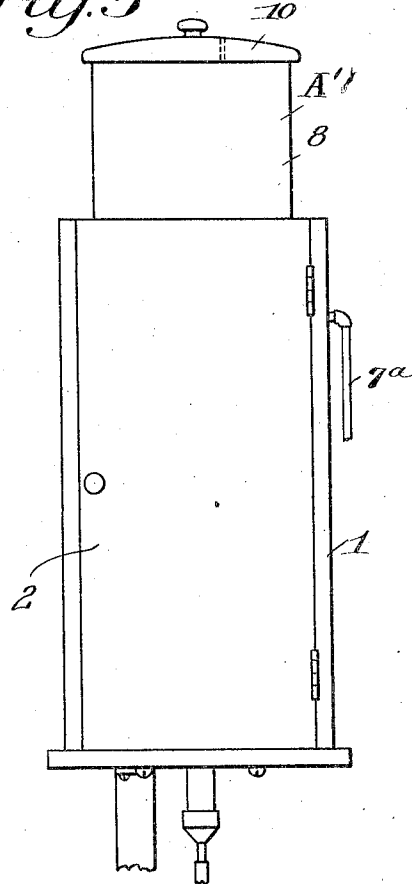
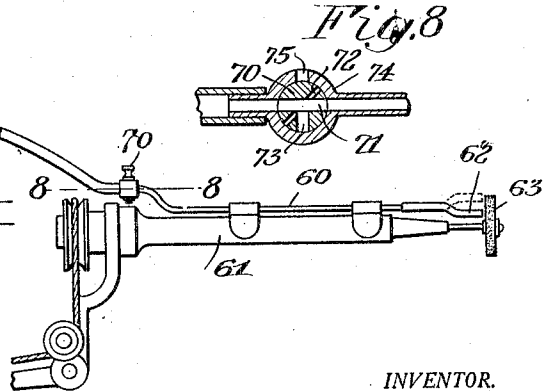


Fig. 8



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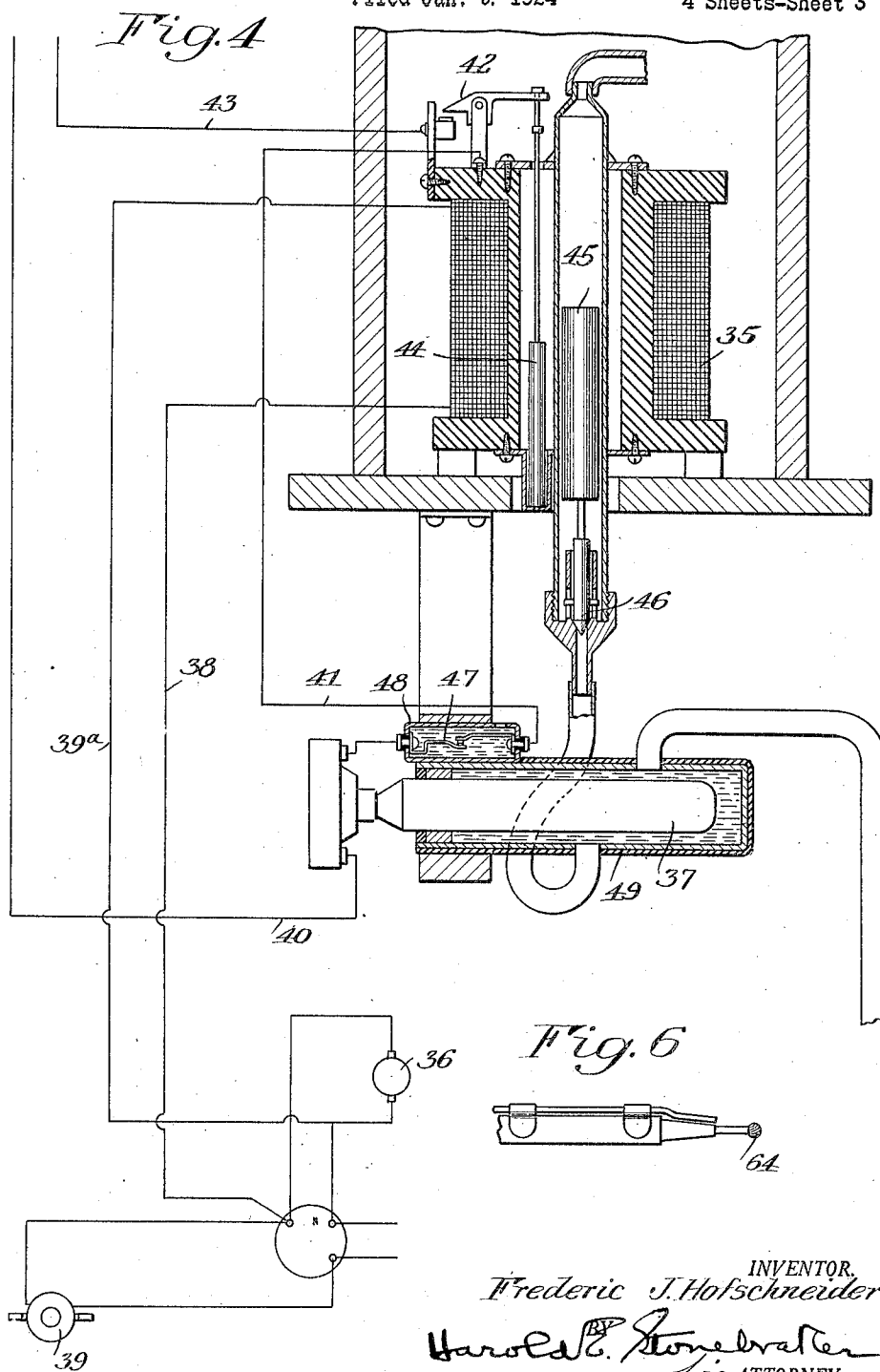
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METHOD AND APPARATUS FOR GRINDING TEETH

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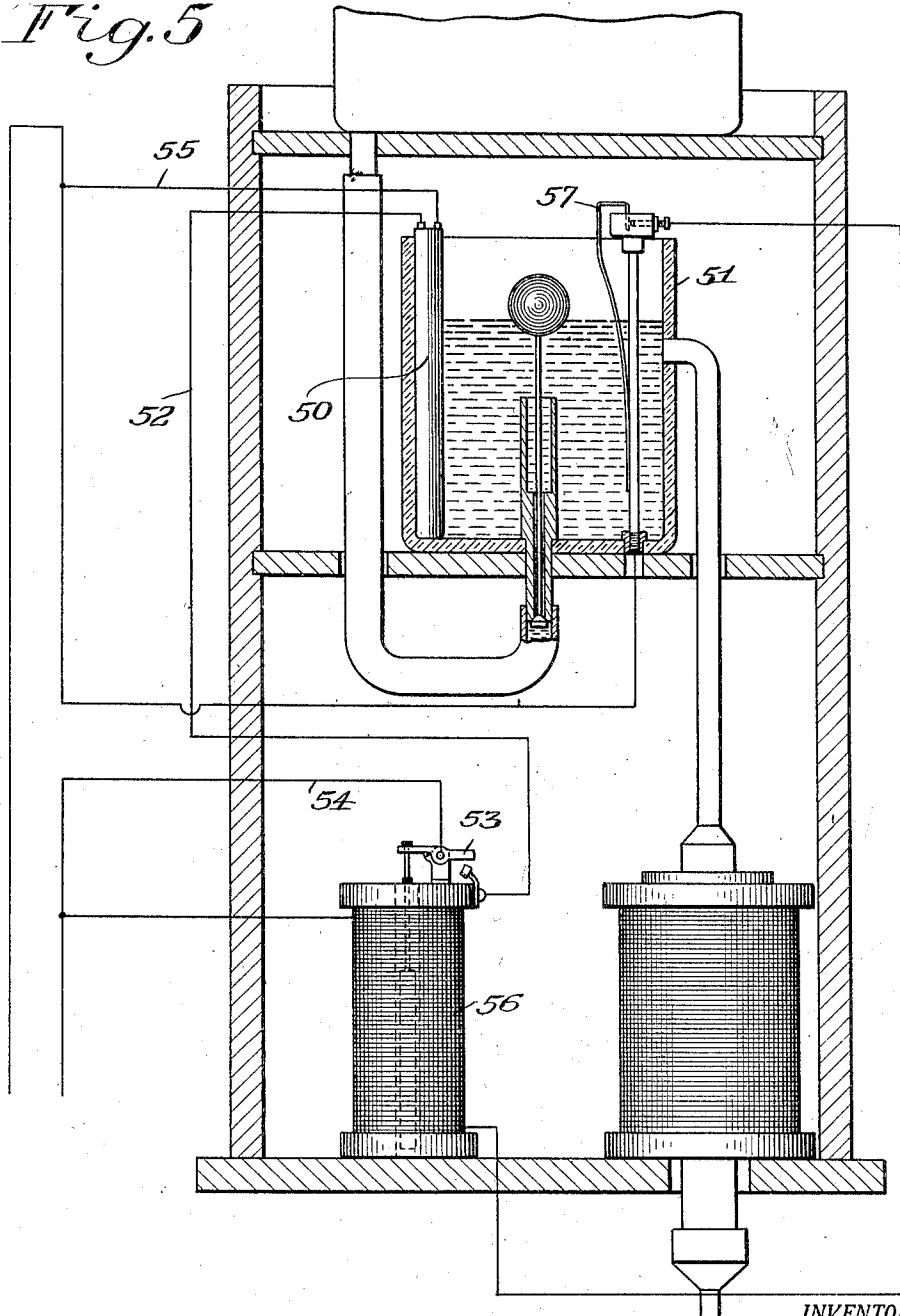
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METHOD AND APPARATUS FOR GRINDING TEETH

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4 Sheets-Sheet 4

Fig. 5



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UNITED STATES PATENT OFFICE.

FREDERIC J. HOFSCHEIDER, OF ROCHESTER, NEW YORK.

METHOD AND APPARATUS FOR GRINDING TEETH.

Application filed January 5, 1924. Serial No. 634,564.

My invention relates to a method and apparatus for grinding teeth, and has for its principal object to afford an almost painless system for grinding teeth or excavating cavities without necessitating injections into the gums to deaden nerves.

More particularly, the invention has for its purpose to provide for bringing an anesthetic into immediate and direct contact with the portion of the tooth being treated, without affecting the gum surrounding the tooth, and to afford mechanism for carrying out such method in a practicable and ready manner.

A further object of my invention is to provide mechanism adapted for operation in conjunction with the conventional type of electrically operated dental engine, and to combine the parts in such a way as to control automatically a supply of liquid to the hand piece, furnishing the liquid when the engine is running and cutting off the supply when the engine stops.

An additional purpose of the improvement is to afford automatic instrumentalities for maintaining the liquid at practically constant pressure and uniform temperature, and to accomplish the latter result by a heating unit that is thermostatically controlled either directly in conjunction with or independently of the automatic liquid supply.

Still another purpose of the invention is to provide mechanism in which an electrical valve controlling device is either in the same circuit with the motor that drives the dental engine, or in an independent circuit and automatically controlled thereby, all the mechanism being equally adaptable to a stone for surface grinding operations or to a burr or drill for cavity excavations.

These and other objects and advantages of the invention will appear clearly from the following description, when read in conjunction with the accompanying drawings, the novel features being pointed out in the claims following the description.

In the drawings:

Figure 1 is a vertical sectional view of a portion of my invention in one embodiment;

Figure 2 is a side elevation, with parts removed, and partially diagrammatic, showing a complete equipment incorporating the structure of Figure 1, the liquid supply tube being arranged for cooperation with a grinding stone;

Figure 3 is a side view of the cabinet for housing the liquid tank and cooperating parts;

Figure 4 is a partial sectional view with parts in diagram, illustrating a modified arrangement of the invention;

Figure 5 is a partial sectional view illustrating another modification;

Figure 6 is a detail partial side view of a hand piece, showing the liquid supply tube positioned on the hand piece for use with a burr;

Figure 7 is an enlarged sectional view of the liquid controlling valve; and

Figure 8 is a sectional view on line 8—8 of Figure 2.

The method and apparatus forming the subject matter of this application is in some respects in the nature of an improvement on the construction incorporated in my Patent No. 1,466,299, granted August 28, 1923.

In general, the present invention is predicated on the idea of grinding a tooth and simultaneously applying an anesthetic-containing liquid at the point of the tooth where grinding occurs, this being accomplished by feeding a continuous supply of anesthetic-containing liquid, preferably heated to a predetermined temperature, to the grinding tool, so that it comes into contact with the tooth and is pressed against the tooth by the grinding operation. Where I employ the term "grinding" throughout the following description and claims it is to be understood as comprehending either a stone or similar abrasive member such as employed for working on outside surfaces, or a burr, drill or similar tool such as employed for excavating or drilling cavities.

I accomplish this result by providing a liquid supply tank which contains an anesthetic in solution, and from which liquid is fed through suitable conducting means to a tube on the hand piece, and discharged at a point adjacent to the tool. The liquid is heated either in the gravity tank or some other point in the supply line and maintained at a predetermined temperature, while being automatically controlled so as to feed only when the engine is running and to be automatically cut off when the engine is idle.

The invention is susceptible of a number of different practical adaptations, several of which are herein disclosed, and I will first

describe the arrangement illustrated generally in Figures 1 to 3. 1 designates a suitable cabinet that may be mounted on a wall or other support and is provided with a door 2, serving to house the liquid tank and electrical valve controlling device. Within the cabinet 1 is arranged a tank 3 from which the liquid feeds to the supply line through an outlet pipe 4, the liquid being maintained at a predetermined level in the tank 3 by means of a valve 5 that is controlled by the float 6 and governs the inlet 7 to the tank. 7^a is an overflow from the tank 3.

The liquid feeds to the tank 3 automatically from a main reservoir 8, resting on the shelf 9, and provided with a suitable cover 10. The cover 10 is readily accessible to the operator, and the usual practice is to fill the reservoir 8 at the beginning of each day with a fresh supply of liquid and the necessary quantity of anesthetic in solution, to be determined by the operator. The liquid feeds from the reservoir 8 to the tank 3 through the pipe 11, the valve 5 and float 6 functioning to maintain a constant level in the tank 3, from which the liquid feeds through the pipe 4 at a practically constant pressure to the grinding tool.

In order to control the supply of liquid automatically, dependent upon starting and stopping of the electric motor that drives the engine, I employ an electrical device, preferably in the form of a solenoid 12, which is located in the cabinet 1, while 13 is a tube extending vertically through the solenoid to permit passage of liquid there-through. 14 designates the core of the solenoid carrying a valve 15, 16 being stop pins mounted on the valve and cooperating with a slot 17 to guide and limit the movement of the valve. When the solenoid 12 is energized, the core 14 is lifted to open the valve and permit passage of the fluid, and when the solenoid is de-energized the core is released and the valve falls, cutting off the liquid supply. The solenoid 12 is preferably in a circuit that is independent of the motor circuit, and which may be controlled by the motor switch. To accomplish this, I have arranged the solenoid in a circuit which includes conductors 18, 19 or 20 alternatively, depending on whether the motor is operating in forward or reverse direction, conductor 21, and conductor 22 to the other side of the line. 23 designates a conventional type of foot controller switch for the dental engine motor, the motor and motor circuit not being shown in Figure 2, but connected with the foot controller switch 23 as usual. 24 is the movable switch member which is operatively connected with and moves the switch 25 that governs the solenoid circuit. When the switch 24 is moved, see Figure 2, in one direction or the other, it closes the

solenoid circuit either through conductor 19 or conductor 20, depending on whether the motor is operated forwardly or reversely, and thus the liquid supply is automatically governed by the operation of the motor, and is cut off the instant the motor stops, or when the switch 24 is in neutral position, as shown in Figure 22. 26 are hand switches in the lines 19 and 20 to permit cutting out the liquid valve control on either the forward or reverse operation of the motor, and 27 is a hand switch for entirely cutting out the liquid valve control if desired.

In order to heat the liquid, it is passed so through a chamber 30 which contains a suitable electrical heating unit arranged in the circuit 31 between conductors 21 and 22, while 32 designates a thermostatic switch that opens the heating unit circuit when the temperature of the liquid reaches a predetermined point. The construction of this heating unit will appear more clearly from consideration of Figure 4, where it is embodied in connection with a modified form of the invention, which will now be described.

In the arrangement shown in Figure 4, the solenoid 35 is in the same circuit with the motor 36 which drives the dental engine and tool, while the heating element, designated generally at 37, is in an independent circuit that is controlled in the following manner. 38 designates a conductor leading from the solenoid to the foot controller switch 39, and 39^a is a conductor leading from the solenoid to the motor. The heating unit 37 is connected with conductor 40 leading from one side thereof, and conductor 41 leading from the other side thereof through a switch 42 and conductor 43 to the other side of the line. The switch 42 is automatically controlled by the solenoid 35 through a secondary core 44 which operates immediately following the main core 45 that controls the valve 46. With this arrangement, upon closing the motor circuit, the core 45 is first elevated and immediately thereafter the core 46, which through the switch 42 closes the circuit to the heating element and thereby starts heating the liquid. Upon opening the motor circuit, the reverse operation takes place. In order to prevent the liquid from becoming excessively hot, I provide means for maintaining it at predetermined temperature by means of a thermostatic switch 47 located in oil in the chamber 48 and forming part of the circuit to the heating element. When the liquid in the heating chamber 49 reaches a predetermined temperature, the switch 47 opens and breaks the circuit to the heating unit.

In the arrangement described and shown in Figures 1 and 2, the electrical valve controlling device or solenoid is in a circuit independent from the motor circuit, which lat-

ter is controlled by the switch 24, and the heating unit is in the same independent circuit with the solenoid 12, whereas in Figure 4 just described, the solenoid that controls the valve is included in the circuit with the motor, while the heating unit is arranged in an independent circuit, and automatically controlled from the solenoid.

Still another possible modification is illustrated in Figure 5, in which the heating element 50 is arranged in the gravity tank 51 from which the liquid is fed. With this arrangement, the liquid heating element is entirely independent of the valve controlling solenoid or of the motor, and is operated from a circuit that includes on one side conductor 52 leading through switch 53 to conductor 54, and on the other side conductor 55 to the line. 56 designates a solenoid that controls the switch 53 and is in turn governed by a thermostatic switch 57 in the tank 51. With the parts as illustrated, the circuit to heating element 50 is open. When the liquid is cooled sufficiently, switch 57 will operate to close the circuit to solenoid 56, thereby closing switch 53 and energizing the heating element 50 to again bring the liquid to the predetermined temperature, after which the switch 57 again opens to de-energize the heating element 50. With the arrangement last described, the liquid is always maintained at a certain temperature, independently of the operation of the motor, and is therefore always ready, whereas with the previously described arrangement, the heating element functions only when the motor is operating.

In Figures 2 and 6, I have illustrated different positions of the supply tube on the hand piece, when cooperating respectively with a stone or burr. 60 designates a tube forming part of the liquid supply means, and preferably detachably positionable on the hand piece 61, although if desirable it may be permanently located thereon, while 62 is an outlet portion or nozzle that is offset from the main part of the tube and is adjustable from the position shown in full lines to that shown in dotted lines in Figure 2. The full line position shows the outlet portion adjusted for cooperation with a small stone or abrasive element 63, while the dotted lines show it adjusted for cooperation with a larger stone. When used with a burr 64, see Figure 6, a slightly different form of outlet or nozzle is employed, bringing the outer end at a point adjacent to the burr. In either case, the position of the discharge is such as to bring to the tool a constant supply of liquid which forms a thin film over the tool at all times, and is thus brought into intimate contact with the tooth directly at the point undergoing treatment.

In some cases, it is desirable to provide a greater flow of liquid than in others, as for

instance when using a drill, a greater volume of liquid supply may be desirable than when using a stone for surface grinding, and in order to adapt the mechanism to such different uses, I employ a valve 70, see Figures 2 and 8, that is adjustable and provided with three ports 71, 72 and 73 respectively, to permit the passage of a coarse stream, fine stream, or to drain the tube quickly when the main valve is closed. The valve 70 is preferably located in a housing 74 at a point adjacent to the hand piece 61 to permit ready control by the operator, and 75 is a port in housing 74, and cooperating with port 73 in the valve to permit quick draining of the tube.

The invention may be carried out in other ways than by the particular structures herein described, and this application is intended to cover any modifications or departures from the present disclosure that may come within the intent of my improvements as herein set forth, or the scope of the following claims.

I claim:

1. The combination with a dental engine hand piece, of a liquid supply tube positionable on the hand piece, a tank, a valve governing the flow of liquid in the tube, automatic means for opening the valve when the engine is running and closing the valve when the engine is idle, gravity conducting means leading from the tank to said tube, and automatic mechanism for maintaining a constant level of liquid in said tank in order to feed the liquid at substantially constant pressure.

2. The combination with a dental engine including a hand piece and an electric motor, of a liquid supply tube positionable on the hand piece, a motor switch, a valve controlling said liquid supply, an electrical device governing said valve, a circuit for said electrical device, and a switch in the last mentioned circuit operatively connected to and operated by the motor switch.

3. The combination with a dental engine, of a liquid supply means comprising a tube on the hand piece of the engine, means for supplying liquid to said tube, and devices acting automatically to maintain said liquid at a predetermined temperature.

4. The combination with a dental engine including a hand piece and electric motor, of a liquid supply tube on the hand piece, a valve, automatic means for opening the valve when the motor is running and closing the valve when the motor is idle, and devices acting automatically to maintain said liquid at a predetermined temperature.

5. The combination with a dental engine including a hand piece and electric motor, of a motor switch, liquid conducting means, a valve controlling said liquid, an electrical device automatically governing said valve, a circuit for said electrical device, a switch in

said circuit which is operatively connected to and operated by the motor switch, and means for automatically maintaining said liquid at a predetermined temperature.

5 6. The combination with a dental engine including a hand piece and electric motor, a motor switch, liquid conducting means, a valve controlling said liquid, an electrical device automatically governing said valve, 10 a circuit for said electrical device, and a switch in said circuit which is operatively connected to and operated by the motor switch, said circuit including an electrical device for heating the liquid.

15 7. The combination with a dental engine, of fluid conducting means, a valve governing the passage of fluid through said conducting means, a motor switch, a circuit independent of the motor circuit, and an electrical device in the last mentioned circuit for opening and closing said valve, a switch for said independent circuit, the said motor switch 20 controlling the last mentioned switch so as to open the valve when the motor is running and close the valve when the motor is idle.

25 8. The combination with a dental engine, of fluid conducting means, mechanism for feeding a substantially constant supply of liquid to the fluid conducting means by gravity, a valve governing the passage of fluid through said conducting means, an electrical device for opening and closing said valve, a circuit for said electrical device independent of the motor circuit, and a motor switch controlling the last mentioned circuit so as to open the valve when the motor is running and close the valve when the motor is idle.

30 9. The combination with a dental engine, of fluid conducting means, a storage tank from which liquid is fed by gravity to said fluid conducting means, mechanism for maintaining a constant level of liquid in said storage tank, an electric motor, a valve governing the passage of fluid through said conducting means, a switch governing said electric motor, and a device controlled by said switch and operating automatically to open 45

the valve when the motor is running and to close the valve when the motor is idle. 50

10. The combination with a dental engine, of conducting means, a storage tank from which liquid is fed by gravity to said fluid conducting means, mechanism for maintaining a constant level of liquid in said storage tank, an electric motor for operating said engine, a motor circuit, a valve governing the passage of fluid through said conducting means, an electrical device for opening and closing said valve, and an independent circuit for said electrical device, the motor switch controlling the last mentioned circuit so as to open the valve when the motor is running and close the valve when the motor is idle. 55 60 65

11. The combination with a dental engine including a hand piece and a motor switch, of a liquid supply tube for the hand piece, a valve controlling said liquid supply, an electrical device governing said valve, a circuit for said electrical device independent of the motor circuit, and means controlled by the motor switch for controlling the last mentioned circuit automatically. 70 75

12. The combination with a dental engine including a hand piece and grinding tool, an electric motor, a liquid supply tube for the hand piece and grinding tool, a valve controlling said liquid supply, an electrical device governing said valve and acting automatically to open the valve when the motor is running and to close the valve when the motor is idle, and a heating device acting automatically to maintain the liquid supply at a predetermined temperature before reaching the grinding tool. 80 85

13. The combination with a dental engine, of fluid conducting means, a valve governing the passage of fluid through said conducting means, a motor switch, and means in the path of and moved by said switch acting automatically to open the valve when the motor is running and to close the valve when the motor is idle. 90 95

In witness whereof, I have hereunto signed my name.

FREDERIC J. HOFSCHEIDER.