

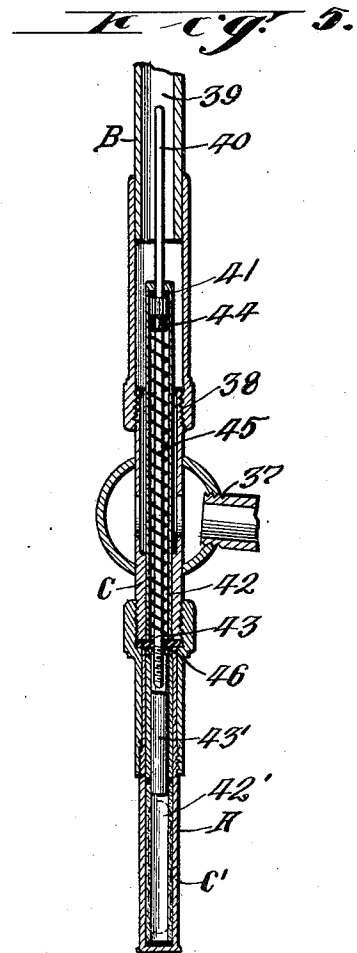
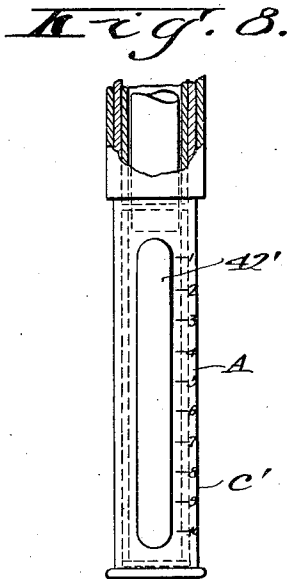
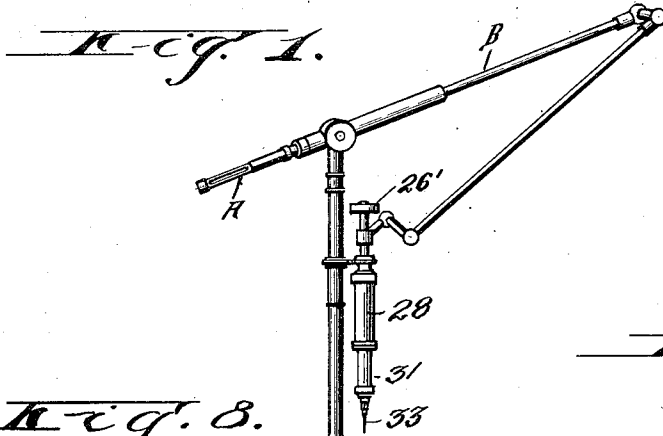
J. P. FLAHERTY.
DENTAL APPARATUS.

APPLICATION FILED OCT. 27, 1910.

1,046,166.

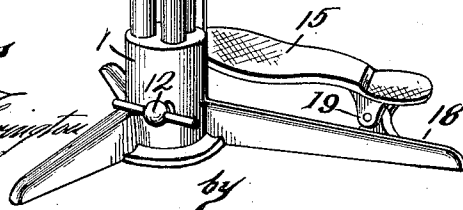
Patented Dec. 3, 1912.

2 SHEETS—SHEET 1.



Witnesses

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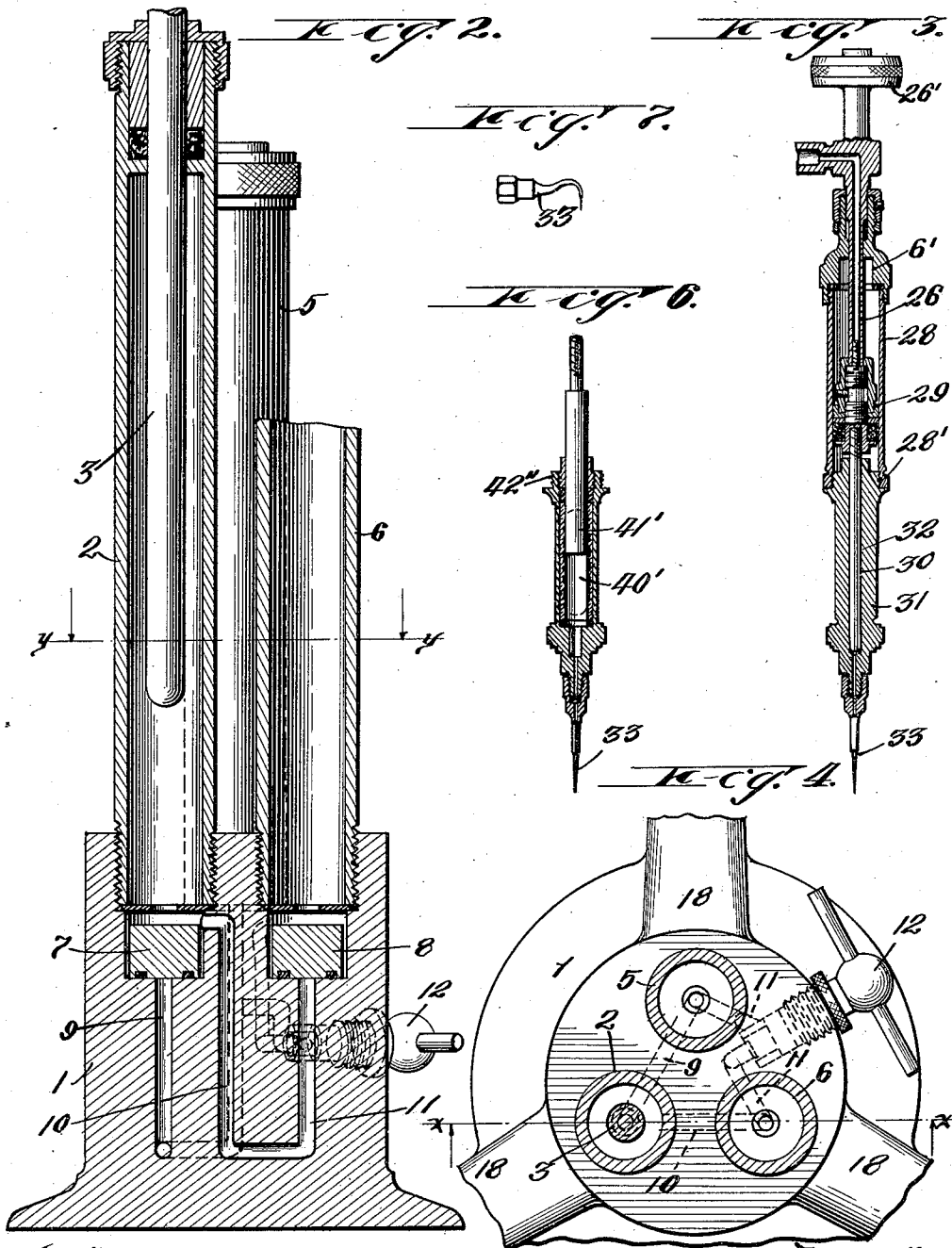
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UNITED STATES PATENT OFFICE.

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DENTAL APPARATUS.

Specification of Letters Patent.

Patented Dec. 3, 1912.

1,046,166.

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To all whom it may concern:

Be it known that I, JAMES P. FLAHERTY, a citizen of the United States, residing at West Bend, county of Washington, and State of Wisconsin, have invented new and useful Improvements in Dental Apparatus, of which the following is a specification.

The object of my invention is to provide means by which a liquid anesthetic may be placed under high pressure and forced through the dentine and into the nerve cavities of a tooth, and it comprises among other things, a force pump adapted to be operated by foot power, a syringe adapted to be manipulated by the hands of an operator, a flexible duct communicating between the force pump and syringe and a fluid medium located in said duct and the cylinders of said pump and syringe, whereby the pressure applied to the piston of the pump will be transmitted to the pistons of the syringe and from thence to the liquid anesthetic.

The construction of my invention is explained by reference to the accompanying drawings, in which—

Figure 1 is a perspective view of the apparatus comprising a force pump, a flexible duct, a syringe and means for indicating the pressure applied to the anesthetic in the syringe. Fig. 2 is a longitudinal section of the pump, drawn on line $x-x$ of Fig. 4. Fig. 3 is a longitudinal section of the syringe. Fig. 4 is a transverse section of the pump, drawn on line $y-y$ of Fig. 2. Fig. 5 is a top view, part in section, of a gage for indicating the pressure applied to the anesthetic. Fig. 6 is a modified form of syringe, and Fig. 7 is a modified form of nozzle, which is used for forcing the anesthetic at right angles to the longitudinal center of the syringe. Fig. 8 is a detail view of the end portions C' of the gage, showing the side opening and the index, the upper portion thereof being illustrated in section to expose the part 43' of the index rod 43.

Like parts are referred to by the same reference figures throughout the several views.

The force pump comprises among other things, a base 1, pump cylinder 2, plunger 3, reservoir 5, standard 6, fluid controlling valves 7 and 8, ducts 9, 10, and 11, and foot valve 12. The bearings between the plunger 3 and cylinder are packed, as indicated in the ordinary manner.

15 is a pedal for operating the pump.

Motion is communicated from the pedal 15 to the plunger 3 through the connecting link 16, pivotal bolt 17 and protruding plunger rod 4. The lower end of the link 16 is pivotally connected with the pedal 15. The pedal 15 is pivotally connected with the base 1 through one of the radial base supporting arms 18 and bracket 19. The fluid medium by which the piston in the syringe is operated, is preferably introduced into the reservoir 5 through the inlet duct 5'. The foot valve 12 being closed, the instrument is filled with fluid by loosening the joint 28' in the hand piece, removing the loose cap 6', pouring liquid into the supply tank 5, then pumping it through the connecting ducts and passages until it appears at the joint 28'. The joint 28' is then tightened. When the supply tank and intermediate tubes have been filled with liquid, such liquid will be retained in the tubes by atmospheric pressure, whether the valve 12 in the base is open or closed.

30 is a plunger or piston, which has closely fitting bearings at 32 in the nozzle 31, and is connected at one end with the piston 29.

33 is a hollow operating needle through which the anesthetic is forced from the nozzle 31 into the dentine or the nerve cavity of a tooth. The needle 33 has screw threaded bearings in the end of the nozzle 31. Preparatory to using the syringe, the nozzle 31 is filled with a fluid anesthetic. This is done by placing the front end of the hollow needle 33 into the anesthetic and by drawing the piston 30 rearwardly when the liquid anesthetic will be drawn into the nozzle by suction. The plunger 30 is drawn back by simply holding the cylinder 28 in one hand and drawing rearwardly on the knob 26', which knob is connected with the piston 29 through the tube or duct 26, as shown in Fig. 3. At the same time, part of the fluid in the tubing and standard is forced out into the reservoir 5. The duct 26 has slidable bearings in the walls of the syringe. The joint around the protruding end of the duct 26 is packed in the ordinary manner. When the space in front of the plunger 30 has been thus filled by the fluid anesthetic, such fluid is forced from the nozzle by the forward pressure of such plunger 30, motion being communicated to the piston 30 from the pedal 15 through the medium of the liquid as herein described, the extreme range of pres-

sure from the most delicate to that of ten thousand pounds or more, to the square inch, being produced by one or more strokes of the pedal 15.

- 5 It will be obvious that owing to the fact that the area of the piston 29 is so much greater than the plunger 30, the pressure applied to the anesthetic in front of the smaller plunger 30 by the liquid from the pump
- 10 against the piston 29 will be greatly multiplied,—for example, one hundred pounds pressure in the aggregate upon the pedal will communicate about seven thousand pounds pressure to the square inch upon the
- 15 anesthetic in the nozzle, whereby the ordinary pressure applied by the operator upon the pedal will force the anesthetic from the syringe with a pressure of about seven thousand pounds to the square inch, when necessary, whereby, as experience has proven, an
- 20 operator is enabled to force a fluid anesthetic through the dentine into the nerve cavities of a tooth, whereby the nerve of a tooth may be reached and removed.
- 25 To ascertain the approximate pressure upon the anesthetic liquid in the syringe, I preferably provide a pressure gage A in connection with the apparatus. The gage A comprises, among other things, 2 cylindrical
- 30 sleeves B and C'. The sleeve B is connected with the standard 6 by a screw threaded joint 37 and the sleeve C' is connected with the sleeve B by a screw threaded joint 38 as shown in Fig. 5. The sleeve B is provided
- 35 with a longitudinal space 39' for the reception of the plunger 40.
- 41 is a packing which serves to prevent the fluid from escaping around the plunger. The sleeve C' is also provided with a longitudinal
- 40 space 42 for the reception of the index rod 43. The rod 43 is provided with a knob 44, which is connected with the adjacent end of the plunger 40. The rod 43 and knob 44 are forced toward the right and
- 45 retained against the plunger 40 by the resilient action of the spring 45, which spring is interposed between the walls 46 and the knob 44. Thus it is obvious that when the plunger
- 50 40 is forced outwardly by the liquid pressure against it, the index rod 43 will be forced outwardly through the space 42' and the spring 45 will be thereby compressed,—that when the pressure is diminished, the rod
- 55 43 and plunger 40 will be forced back to their original position by the recoil of said spring. One side of the sleeve C' is cut away so as to expose one side of the index
- 60 rod 43; and the sides of said sleeve C' may be provided with appropriate index marks, or characters to indicate the movement of said plunger and index rod, whereby the approximate pressure of the liquid against the plunger is ascertained. Thus the operator
- 65 may readily determine the pressure which is being applied to the fluid anes-

thetic when forcing the same through the dentine of the tooth.

It will of course be understood that if desired, other flexible ducts may be substituted for those shown in the drawings, but owing to the excessive pressure to which the liquid is subjected at times, metallic ducts are preferable.

By the modified form of syringe shown in Fig. 6, the pressure applied to the liquid through the pedal, plunger 3 and connecting tubes, is communicated to the anesthetic, which is located in the chamber 40' through the plunger 41', it being understood that such syringe is adapted to be connected with the cap 6' of the syringe shown in Fig. 3, the other parts of the device shown in Fig. 3 being first removed when the threaded joint 42'' is adapted to be screwed into the threaded joint 28' of the device shown in said Fig. 3. The object of the modified form of syringe shown in Fig. 6 is not only to simplify the construction, but to reduce the pressure applied to the anesthetic, as under some circumstances is desirable. It will be understood that as the plunger 41' is drawn back in the cylinder 40', the liquid anesthetic is drawn into the syringe through the hollow needle 33, as previously described, and that a small quantity of air is also therefore simultaneously permitted to enter the syringe, whereby the air in the syringe forms an elastic cushion, whereby a yielding reduced pressure is applied to the anesthetic.

Preparatory to operating the pedal 15 and pump plunger connected therewith, water or other liquid is placed in the reservoir 5. When this is done, the plunger 3 is drawn upwardly by the upward movement of the pedal, whereby a quantity of water or other liquid is drawn from said reservoir 5, through the duct 9, past the valve 7, and into the pump cylinder 2. When the pump cylinder 2 is thus filled with liquid, the movement of the pedal and plunger is reversed, whereby the liquid thus drawn into the pump cylinder, is forced therefrom out through the duct 11, past the check valve 8, and into the hollow standard 6, through which standard it is led to the operating instruments, as previously described, which instruments are connected with the upper end of said standard.

It will be understood that the plunger 3 is connected with the upper end of the pump cylinder 2 through a closely fitting packing, whereby, as such plunger is withdrawn from the cylinder through such packing, a partial vacuum will be formed in such cylinder, whereby a quantity of liquid corresponding with the space previously occupied by the plunger will be drawn from the reservoir into said cylinder. As soon as the movement of said plunger is reversed by the movement of the pedal, the liquid which has

been thus drawn into the cylinder will be displaced by the plunger and forced thereby out into the hollow standard 6, as previously described. It will also be understood that as soon as the liquid ceases to pass either of said check valves 7 or 8, they will at once drop to their seats and prevent the return of such liquid past them in the opposite direction.

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

1. In an apparatus for treating teeth, the combination of a syringe, a pump located at a distance from said syringe, a duct communicating between said pump and the cylinder of said syringe, a liquid located within said pump and duct and means for communicating pressure to the liquid in said pump, whereby the pressure applied to the liquid in the pump is transmitted to the piston of the syringe.

2. In an apparatus of the described class, the combination of a syringe comprising two cylinders each of which is provided with a closely fitting piston, a pump located at a distance from said syringe, a duct communicating between said pump and the larger cylinder of the syringe, a liquid located within said duct and last named cylinder, means for applying pressure to the liquid in said pump, whereby the pressure so applied is transmitted through said fluid to the larger piston of the syringe, and means for communicating motion from the larger to the smaller piston of said syringe, whereby the fluid pressure in the larger cylinder of the syringe is transmitted with greatly increased pressure to the liquid in the smaller cylinder of the syringe.

3. In an apparatus of the described class, the combination of a syringe and pump located at a distance from said syringe, a duct communicating between the cylinder of said pump and the cylinder of said

syringe, a liquid located within said cylinders and duct, means for communicating pressure to the piston of said pump, whereby the pressure applied to the piston of the pump is transmitted through said fluid to the piston of the syringe, an index gage communicating with said fluid duct, whereby the pressure applied to the fluid in said duct may be readily ascertained, substantially as set forth.

4. In an apparatus of the described class, the combination of a syringe, a pump located at a distance from said syringe, a duct communicating between the cylinder of said pump and the cylinder of the syringe, a liquid located within said cylinders and duct, means for communicating pressure to the piston of said pump, whereby the pressure applied to the piston of the pump is transmitted through said fluid to the piston of the syringe, means for controlling the passage of the fluid between said syringe and said pump, whereby the pressure on the fluid in the syringe may be maintained or released, increased or diminished at the will of the operator.

5. In an apparatus of the described class, the combination of a syringe, a liquid reservoir and pump located at a distance from said syringe, a duct communicating between said pump and said syringe, a branch duct communicating from said last named duct to said reservoir, a duct communicating from said reservoir back to said pump, a liquid medium located in said ducts, reservoir and the cylinders of said pump and syringe, and means for communicating pressure to the piston of said pump, all substantially as and for the purpose specified.

In testimony whereof I affix my signature in the presence of two witnesses.

JAMES P. FLAHERTY.

Witnesses:

JAS. B. ERWIN,

I. D. BREMER.