July 26, 1938. A. F. PIEPER 2,124,747

FLUID CONTROL DEVICE

Filed June 4, 1935 2 Sheets-Sheet 1

Fig. 1

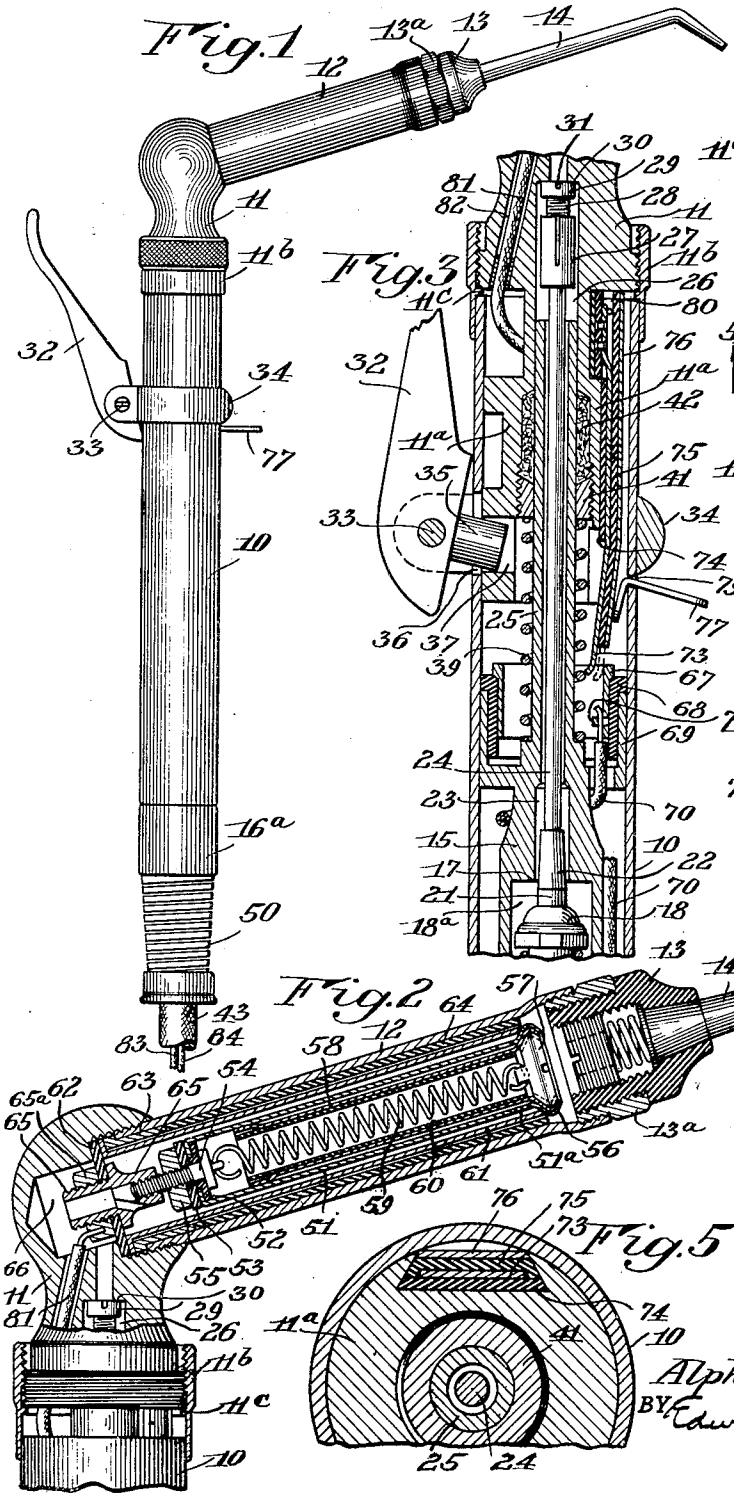


Fig. 3

Fig. 4

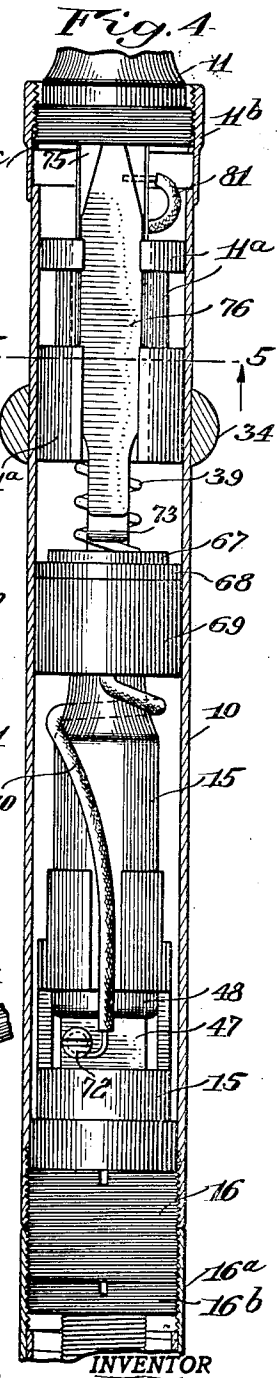


Fig. 2

Fig. 5

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Fig. 6

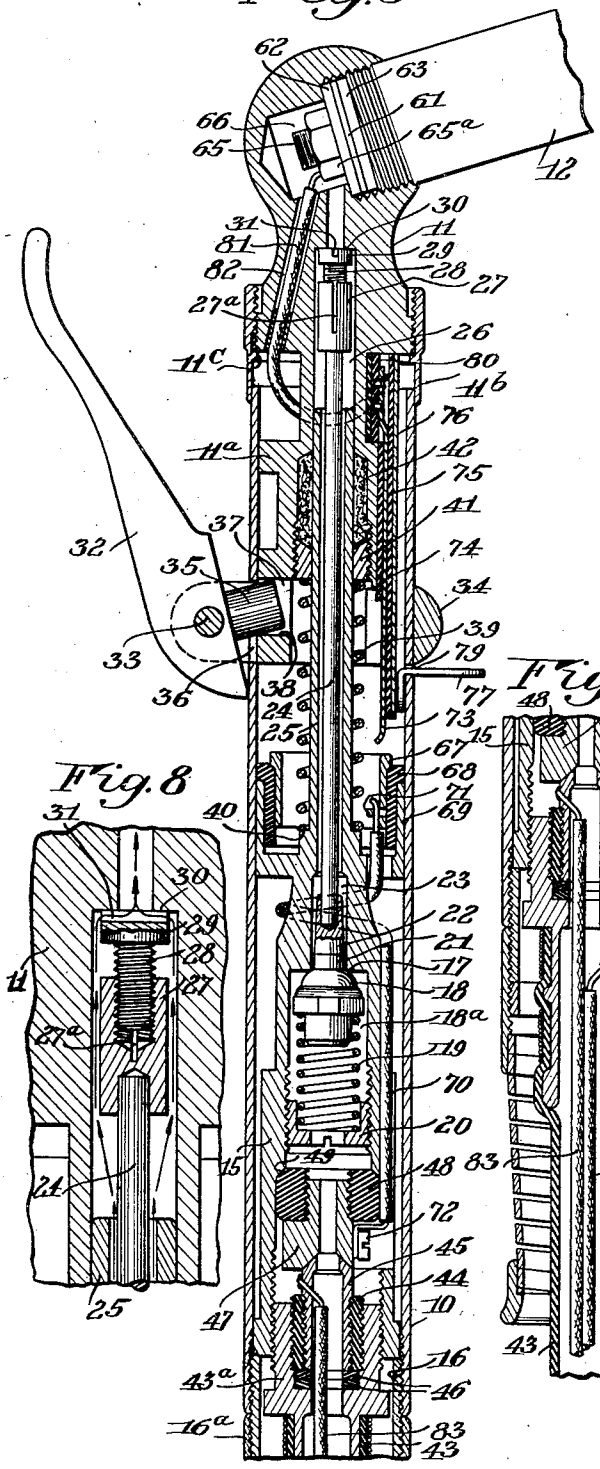


Fig. 7

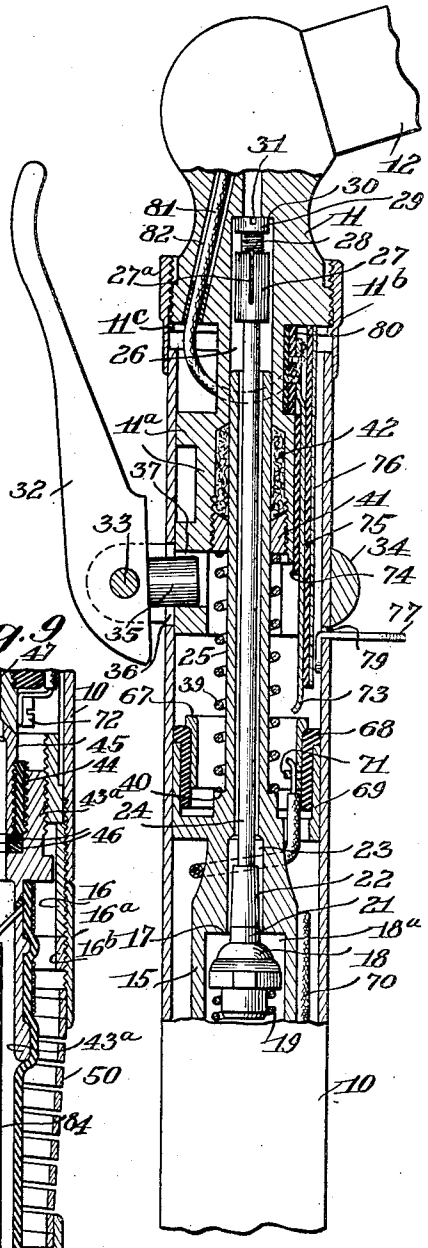


Fig. 8

Fig. 9

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UNITED STATES PATENT OFFICE

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FLUID CONTROL DEVICE

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Application June 4, 1935, Serial No. 24,904

26 Claims. (Cl. 128—400)

The present invention relates to a fluid control device such, for example, as one of the dental syringe type and has for its object to provide in a device of this class an improved arrangement of fluid heating and control parts designed in a manner to afford economy in the construction, as well as in the operation of the syringe.

A further object of the invention is to provide an improved syringe embodying a plurality of unitary and detachably associated sections which can be readily connected and separated one from another and which cooperate to afford a compact, efficient, and dependable fluid control device of the class described.

A further object of the invention is to provide in combination with devices for heating and controlling the flow of the fluid, operating parts therefor which can be readily controlled by one hand at one and the same time and in which operation of the heating device may be discontinued at will without releasing the means for controlling the discharge of the fluid to the nozzle.

A further object of the invention is to provide in conjunction with certain of the parts for controlling the flow of the fluid to the heater, an improved circuit arrangement for supplying current to the latter.

A further object of the invention is to provide an improved syringe formed of detachably associated unitary sections a plurality of which include electric circuit connections for the heating coil circuit, in which arrangement the connections are made detachable with the sections with which they are associated without disturbing their relationship with respect to said sections.

A further object of the invention is to provide improved means for adjusting and regulating the valve for controlling the discharge of the fluid to the nozzle of the syringe.

To these and other ends the invention resides in certain improvements and combinations of parts, all as will be hereinafter more fully described, the novel features being pointed out in the claims at the end of the specification.

In the drawings:

Fig. 1 is a view in elevation of a syringe embodying the invention;

Fig. 2 is an enlarged longitudinal section through the portion of the syringe containing the heating coil;

Fig. 3 is a fragmentary longitudinal section through the end of the syringe containing the switch and fluid outlet valve, with the latter shown in open position and with the switch shown by dotted lines, in closed position;

Fig. 4 is a longitudinal section through the casing forming the handle of the syringe with the parts contained therein shown in full;

Fig. 5 is a transverse section on lines 5—5 of Fig. 4;

Fig. 6 is a longitudinal section through the casing with the fluid outlet valve shown in closed position and the switch in open position;

Fig. 7 is a somewhat similar view with the valve shown in partially open position and with the switch also shown in open position;

Fig. 8 is an enlarged fragmentary section showing the construction of the valve adjusting means, and

Fig. 9 is a fragmentary longitudinal section through the inner end of the main mechanism casing showing the manner of extending the circuit wires through the fluid supply conduit and illustrating the method of attaching them to the terminal portions of the conduit.

The same reference numerals throughout the several views indicate the same parts.

The syringe includes generally, four detachably associated unitary sections carried by the handle or body portion of the syringe. These sections may be conveniently referred to as the heating unit section, the valve operating section, the valve supporting section, and the conduit or fluid supply section, all of which will be described hereinafter.

Referring to the drawings, 10 comprises the body or handle of the syringe which constitutes the main mechanism casing and within which is longitudinally movable the valve operating tubular member 11, the outer end of which is recessed to receive the inner end of the heating unit section, embodying the housing 12 and the heating coil therein, said housing having a coupling 13 detachably mounted thereon and carrying the nozzle 14, suitably connected with the coupling as best shown in Fig. 2.

The valve supporting section, designated generally by the reference numeral 15, is disposed within the casing 10 and has its inner end resting on a tubular member 16 threaded within the lower end of the casing and adjustable therein to regulate the position of the section 15 with respect to other parts described hereinafter. The section 15 is of tubular construction and is provided with a seat 17 for the valve 18 which is normally urged into engagement with the seat by a spring 19 supported within the valve chamber 18a and having its lower end within a re-

cessed nut 20 threaded within the tubular section and adjustable therein to properly tension the spring.

The valve has an extension thereon comprising a cylindrical portion 21 terminating in a tapered or conical portion 22, each of said portions normally lying within the recess or bore 23 of the section 15. Loosely positioned within the tapered portion 22 of the valve extension is an operating stem or element 24 which extends through the reduced portion 25 of the section 15 into the bore 26 of the tubular member 11, the latter having a fluid outlet passage leading to the interior of the housing 12 containing the heating coil.

The upper end of the valve stem has fixed thereon an extension 27 slotted at 27*a* and threaded to receive a screw 28 the head 29 of which engages a seat 30 on the tubular member 11. By slotting the extension the opposing jaws thereof will yieldingly grip the screw to firmly hold it in adjusted position. The screw is slotted at 31 for the reception of a suitable tool for turning it to adjust the valve stem 24 whereby to regulate the position of the valve 18 to accommodate it to its seat. The slot 31 also serves as an outlet passage for the fluid admitted to the bore 26 of the tubular member 11 upon opening the valve. To effect opening of the valve it is only necessary to move the tubular member 11 inwardly of the casing 10, which is done by swinging the lever 32 toward the casing from the normal position shown in Fig. 6. The lever is pivotally supported at 33 on a band 34 substantially surrounding and suitably secured on the casing 10. The lever has a laterally projecting part 35 extending through an opening 36 formed in the side wall of the casing and into a recess 37 formed in the wall 11*a* of the tubular member 11. The projecting part 35 of the lever engages a shoulder 38 on the tubular member whereby when the lever is moved toward the casing 10 the said member will be moved longitudinally within the casing to unseat the valve, as shown in Figs. 6 and 7.

By making the cylindrical portion 21 of the valve slightly smaller in diameter than the diameter of the bore 23 of the tubular member, a restricted flow of the fluid to the nozzle is provided for upon the initial opening of the valve. However, upon continued downward movement of the valve the tapered portion 22 thereof will permit of a gradual increase in the size of the opening through which the fluid is discharged, thus affording a gradual increase in the volume of the stream discharging to the nozzle whereby to insure a smooth and even flow of the fluid.

The tubular section 15 is yieldingly held in engagement with the adjustable coupling member 16 by means of a spring 39 surrounding the reduced portion 25 of the section and having one end seated on a shoulder 40 thereof and the other end engaging a packing nut 41 screwed into a recess formed within the portion 11*a* of the tubular member 11 extending within the casing 10, the recess having suitable packing 42 therein by which a fluid tight joint is afforded between the extension 25 and the portion 11*a* of the tubular member.

The fluid is delivered to the valve chamber through a hose or conduit 43 which may be connected with a suitable supply source, not shown. The discharge end of the conduit is suitably connected with a recessed coupling member 43*a* threadedly engaging the inlet end of the tubular section 15. Threaded within the coupling is a member 44 formed of insulating material and within which is threaded a terminal or tubular part 45 forming the extremity of the fluid supply or conduit section referred to above. Interposed between the inner ends of the parts 44 and 45 and the bottom of the recess in the coupling member 43*a* are a pair of washers 46, also formed of insulating material and serving to prevent the escape of fluid between the coupling 43*a* and the member 44 and between the latter and the terminal part 45 of the conduit. The outer washer also constitutes a seat for the inner end of the terminal part 45 whereby it is prevented from being screwed down into engagement with the transverse wall of the coupling, from which it is necessary to insulate the same. The outlet end of the terminal part 45 is preferably made conical and is seated within a recess formed in a nipple 47 which is threaded within an annulus 48 formed of insulating material and seated upon a shoulder 49 of the tubular section 15 whereby a fluid tight joint is afforded between the annulus and said section. The annulus may be frictionally supported or otherwise held within the tubular section in engagement with said shoulder, the annulus together with the nipple 47 forming a part of the unitary valve supporting section of the syringe.

It will be understood that the unitary section for supplying fluid to the valve supporting section includes the conduit 43, the coupling 43*a* and the parts 44 and 45, all of which are made detachable as a unit from the valve supporting section by unscrewing the coupling from the inlet end of the tubular section.

The tubular member 16 forming a support for the valve casing section 15, has threaded thereon an extension 16*a* for supporting the flexible guard 50 for the fluid supply conduit 43, as best shown in Fig. 9. Upon removal of the member 16 and the extension 16*a* from the casing 10, the conduit or fluid supply section and the valve carrying section of the syringe can be withdrawn from the casing as a unit, or if preferred the former may first be removed by unscrewing the coupling 43*a*, after which the valve carrying section can be removed as a separate unit by moving it longitudinally of the casing through the inner end thereof.

If it is desired to remove the unitary valve operating section 11 of the syringe from the casing 10 it is only necessary to detach the lever 32 from the band 34, after which said section and associated parts can readily be withdrawn from the outer end of the casing. It will also be understood that the heating unit section 12 can be removed from the valve operating section 11 by unscrewing it therefrom.

The heating element is shown in detail in Fig. 2 and embodies an outer tube 51 closed at its inner end by gaskets 52 and 53 formed of insulating material and having a screw 54 extending therethrough and secured thereon by a nut 55. The outer end of the tube 51 is expanded as at 56 to receive the correspondingly expanded end 57 of an inner tube 58 spaced from the outer tube to provide an air passage between said tubes. Within the inner tube is located a heating coil 59, the inner end of which is suitably connected with the screw 54, the other end being connected with the expanded end 57 of the inner tube. The coil is protected by an insulating sleeve 60 disposed within the inner tube. The heating element is surrounded by a metal tube 61 on the outer end of which is seated the expanded portion of the

tube 61. The metal tube 61 has its inner end flanged outwardly and seated on an insulating disk 62 disposed within the head of the tubular member 11. A collar 63 is sleeved on the inner end of the tubular member 61 and engages the flanged portion of the latter, the collar being fitted closely within the inner end of the heater casing 12. The tube 61 and collar 63 are clamped in position within the head of the tubular member 11 by screwing the heater casing 12 therein as shown in Fig. 2. A sleeve 64 of suitable insulating material is inserted between the tubular member 61 and the casing 12 to prevent loss of heat by radiation from the coil 59. The tubular member 51 containing the heating coil is secured within the casing 12 by the screw 54 which is threaded within a nipple 65 having a nut 65a thereon for securing the nipple upon the insulating disk 62.

The fluid permitted to discharge past the valve 18 enters the chamber 66 of the tubular member 11, from whence it passes through the nipple 65 around the tube 51 to the outer end thereof for discharge through the apertures 51a therein to the passage between said tube 51 and the inner tube 58. The fluid discharging from the inner end of said passage enters the tubular insulating member 60 and passes therethrough in contact with the heating coil and is discharged to the nozzle 14 through the coupling 13, formed of insulating material and detachably associated with a collar 13a threaded within the outer end of the housing 12.

The switch for controlling the heating coil circuit is so arranged that it cannot be closed until after the valve has been opened to permit the air to pass through the heater in contact with the coil, whereby to prevent overheating of the latter and the possibility of its being burned out under excessive temperatures. In other words, by subjecting the coil to the cooling effect of the discharging air before closing the circuit, and maintaining a constant flow of air around the coil after the circuit has been closed, the danger of overheating or burning out the coil is reduced to a minimum.

Furthermore, the switch is so constructed that it can be readily opened by the operator as soon as the air becomes heated to the desired degree, this being accomplished by the use of one finger without having to remove the hand from the valve operating lever and without changing its position relative to the lever.

The fixed element 67 of the switch preferably comprises a ring-shaped member inserted within a correspondingly shaped insulating member 68 disposed within the cylindrical portion 69 of the valve carrying tubular section 15.

Electrical connection is made between the nipple 47 of the section 15 and the fixed switch member 67 by a wire 70, the outer end of the wire being suitably connected with a part 71 which is preferably formed on the ring-shaped member 67, Fig. 6. The opposite end of the wire is attached to the nipple 47 by means of a screw 72, the wire 70 thus being attached to the valve carrying section for removal therewith from the casing 10.

The movable contact member 73 of the switch is disposed within a recess formed in the portion 11a of the tubular member 11 lying within the outer end of the casing 10, as shown in Fig. 5. The contact member 73 is interposed between a pair of insulating strips 74 and 75, one of which serves to insulate said member from the portion 11a of the tubular member, and the other of which separates it from a metal strip 76 forming a bearing for the inner end of the finger lever 77 having its operating part extending through a slot 79 in the wall of the casing 10. The contact member 73 is formed of spring-like or resilient material and the strips 75 and 76 associated therewith are sufficiently flexible or yieldable to be moved by the lever 77 when operating it to open the switch.

The closing of the switch is effected by operating the lever 32 to move the tubular section 11 inwardly of the casing 10 to open the valve, at which time the contact member 73 is moved into engagement with the fixed contact member 67, as shown by dotted lines in Fig. 3. In this position of the parts the switch may be opened by moving the contact member 73 from engagement with the fixed contact 67 as shown in Fig. 3, in which position it may be held as long as desired by continuing to press down on the lever 77 with the finger while holding the valve operating lever 32 in the position shown in Fig. 3. Upon release of the switch control lever the contact member 73 will spring back into engagement with the fixed contact 67 to again close the circuit, assuming that it is desired to raise the temperature of the fluid while continuing to hold the valve in open position. However, upon release of the valve control lever 32, the tubular member 11 of the syringe will be returned by the spring 39 to the normal inoperative position shown in Fig. 6 in which the valve 18 is closed to prevent the escape of fluid to the nozzle.

The upper end of the movable contact member 73 is suitably secured upon a section 80 of insulating material which may be held in position upon the portion 11a of the tubular member 11 by any preferred means, not shown.

A wire or flexible connection 81 has its inner end suitably secured upon the outer end of the movable contact 73, the opposite end of the wire being connected with the nut 65a of the nipple 65, as shown in Fig. 2. The nipple 65 and screw 54 serve to connect the wire with the heating coil 59. The wire 81 is extended through a passageway 82 formed in the head of the tubular member 11, as shown in Fig. 6, the portion of the wire within the casing 10 having sufficient slack to take care of the movement of said tubular member between its extreme positions.

Wires 83 and 84 adapted for connection with a current supply source, not shown, are extended through the fluid supply conduit 43 as best shown in Fig. 9. The wire 83 has its inner end extended through the wall of and is secured on the outer face of the terminal member 45 which is in contact with the nipple 47, whereby electrical connection is made between the wire 83 and the wire 70 of the tubular section 15. The end of the wire 84 is connected with the coupling 43a as shown in Fig. 9. When the hand lever 32 is moved to the position shown in Fig. 3 to effect complete opening of the valve 18 the contact member 73 will be moved into engagement with the fixed contact 67 at which time the current will pass from the wire 83 through the tubular parts 45 and 47 to the conductor 70, thence through the contacts 67 and 73, conductor 81, nipple 65, screw 54, and heating coil 59. From the heating coil the current will return by way of the expanded ends 57 and 56 of the inner and outer tubes 58 and 51, respectively, and through the tubular member 61, collar 63, casing 12 to the tubular member 11 and thence through the sleeve 11b,

mechanism casing 10, the inner end of the valve carrying section 15, through the coupling 43a to the wire 84, and through the latter to the battery or other current supply source, not shown.

By using the tubular member 11 and casing 10 as conducting means for a portion of the circuit, the difficulty which would be encountered in carrying additional circuit connections through said members is avoided, as well as the increase in the cost of having to supply and install such additional connections within said members. Furthermore the omission of such circuit connections from said members makes it possible to construct the syringe of a plurality of detachable unitary sections, as described above, each of which includes conducting means which remains attached thereto after removal of the sections one from another.

It will be obvious that there is a decided advantage in so constructing the syringe as to provide for a plurality of detachable units having electrical circuit connections which do not have to be disconnected or detached from the units before separating one from another and which are applied to and secured upon the units before assembling the same to complete the syringe. This feature, in conjunction with that of returning the current through the handle of the syringe, affords an extremely economical arrangement of unitary parts which can be quickly assembled or detached one from another when occasion demands. Such an arrangement of parts not only affords economy in the construction of the syringe, but also in the cost of operating the same. If, for example, it is desired to repair any portion of the heating unit section, it can be quickly removed from the head of the unit 11 to permit the parts to be removed from the casing 12 for inspection and such repairs as may be required. Likewise by removing the hand lever 32 from the casing 10 the valve operating section 11 can be readily withdrawn from the casing 10 to render the parts of said section accessible for inspection and repairs. The same applies to the valve supporting section 15, which can be readily withdrawn from the casing 10 after unscrewing the part 16 therefrom. On the other hand, if it is desired to examine and repair the parts of the fluid supply section 43, the latter can be removed by unscrewing it from the valve carrying section 15. The several unitary sections can readily be assembled to complete the syringe, as well as detached for repairs or other purposes, since each unit is complete in itself, requiring only that it be assembled upon or screwed into proper relation with respect to the unit with which it is directly associated. The individual members of the different units are also arranged in such a manner as to afford a simplified unitary section of relatively few parts which can be conveniently assembled and secured one upon another, whereby to economize both in the construction of the individual units and in the cost of repairing the same.

In assembling the tubular members 11 and 15 within the casing 10 it is necessary to provide for a substantially accurate adjustment of one relative to another in order that the distance between the valve seat 17 and the shoulder 39 on the tubular member 11 may be made to closely correspond to the distance between that portion of the valve engaging the seat and the outer end of the screw 38. After determining the approximate normal positions of the tubular members within the casing the distance between the inner end of the member 15 and the inner end of the casing 10 can be measured whereby to determine the position of the member 16a on the member 16 for supporting the tubular member 15, so that said members may be permanently secured one upon another to insure proper positioning of the tubular member 15 within the casing 10 whenever it may become necessary to remove it therefrom and to replace it therein, as may be required when making repairs, or for other reasons. Any suitable means may be provided for preventing relative displacement of the parts 16 and 16a such, for example, as the lock nut 16b shown in Figs. 4 and 9.

The collar 11b is provided with an inwardly projecting annular part 11c for engagement with the outer end of the casing 10 when the hand lever 32 is moved to the position shown in Fig. 3. Since the collar is threadedly disposed on the tubular member 11 it can be adjusted to different positions thereon, according to the extent to which it is desired to open the valve. The adjustment can readily be effected by the operator, should he for any reason desire to reduce or limit the rate of flow of the fluid at any time.

An important feature of the invention is the mounting of the valve carrying unit 15 of the syringe for a rotary or swiveling movement within the casing 10, whereby to provide for relative rotation between the casing and said member to avoid the trouble ordinarily experienced by the tendency of the supply conduit to kink or become twisted in operation. With this improvement it is not necessary to disconnect the supply conduit from the syringe to straighten it, as has been the case in similar types of syringes heretofore placed on the market.

It will be understood that rotation of the tubular member 15 within the casing 10 will not interfere with the operation of the switch, since the contact member 67 is of cylindrical construction and will engage the contact 73 at all positions to which the member 15 may be rotated when the valve is in the open position shown in Fig. 3.

I claim:

1. A syringe including relatively movable tubular body members adapted for the passage of the fluid therethrough, a valve for controlling the flow of the fluid and opened by one of the body members when moving it to a predetermined position relative to another, electric heating means for the fluid having a switch closed by movement of one of said body members upon effecting relative movement between the body members to open the valve, and separate operating devices one for effecting relative movement between said body members to open the valve and another being manually operable to open the switch when the valve is in open position.

2. A syringe including relatively movable tubular body members adapted for the passage of the fluid therethrough, a valve for controlling the flow of the fluid and opened by one of the body members when moving it to a predetermined position relative to another, electric heating means for the fluid having a switch including normally spaced contacts one of which is secured on the movable body member for movement thereby to engage the other contact when said movable member is at said predetermined position, and manually operable devices arranged for control by one hand, one for effecting relative movement between said body members to open the valve and another being subsequently oper-

able to open the switch while the valve is in open position.

3. A syringe including a pair of relatively movable telescoping body members adapted for the passage of the fluid therethrough, a valve for controlling the flow of the fluid through said body members opened by movement of one relative to another, and electric heating means mounted within one of the body members and exteriorly of the other and adapted for heating the fluid discharging therethrough, said heating means having a switch closed by movement of one of the members relative to another subsequent to the opening of the valve.

4. A syringe including relatively movable telescoping members adapted for the passage of the fluid therethrough, a valve for controlling the flow of the fluid through said members opened by movement of one relative to another, electric heating means associated with one of the members for heating the fluid discharging therethrough and having a switch closed by movement of one of the members relative to another subsequent to the opening of the valve, and separate operating devices arranged for control by one hand, one for effecting relative movement between said members whereby to open the valve and another being operable to open the switch while the valve is being held in open position.

5. A syringe including relatively movable tubular body members adapted for the passage of the fluid therethrough, a normally closed valve for controlling the flow of the fluid operated by one of said body members when it is moved to a predetermined position relative to another, operating means for said valve controlling member, electric heating means for the fluid having a switch comprising a fixed contact on one of said body members and a second contact secured on and movable with the valve operating member to engage the fixed contact subsequent to the opening of the valve, manually operable means for moving one of said contacts to open the switch when the valve is in open position, and means for returning the valve opening member to normal position upon release of said operating means.

6. A syringe including relatively movable tubular members adapted for the passage of the fluid therethrough, a valve for controlling the flow of the fluid opened by one of the members when moving it to a predetermined position relative to another, electric heating means for the fluid having a switch including normally spaced contacts one of which is secured upon said movable member for movement thereby to engage the other of said contacts when said movable member is approaching said predetermined position, an operating device for moving said last mentioned member to said predetermined position, and a device for moving one of said contacts from engagement with the other when the valve is in open position.

7. A syringe including relatively movable tubular members adapted for the passage of the fluid therethrough, a valve for controlling the flow of the fluid opened by one of the members when moving it to a predetermined position relative to another, electric heating means for the fluid having a switch including normally spaced contacts one of which is secured upon said movable member for movement thereby to engage the other of said contacts when said movable member is approaching said predetermined position, an operating device for moving said last mentioned member to said predetermined position, one of said contacts being formed of resilient material, and an operating device for moving said last mentioned contact from engagement with the other contact when the valve is in open position, said last mentioned contact automatically returning to engagement with the other contact upon release of the operating device therefor when retaining the valve in open position.

8. A syringe including associated tubular members adapted for the passage of the fluid therethrough and mounted for movement one relative to another, a nozzle carried by one of said members, another of said members having an inlet for fluid under pressure, a valve for controlling the passage of the fluid through said inlet opened by movement of one of the members when it is moved to a predetermined position relative to another, an electric heater for the fluid located between the nozzle and the valve, circuit connections cooperating with parts of said tubular members to afford current conducting means for the heater circuit, a switch interposed in said connections and closed by said movable member upon movement thereof to said predetermined position, and operating devices one for effecting movement of said last mentioned member to said predetermined position and another operable to open the switch when the valve is in open position.

9. A syringe including associated tubular members adapted for the passage of the fluid therethrough and mounted for movement one relative to another, a nozzle carried by one of said members, another of said members having an inlet for fluid under pressure, a valve for controlling the passage of the fluid through said inlet opened by movement of one of the members when it is moved to a predetermined position relative to another, an electric heater for the fluid located between the nozzle and the valve, circuit connections cooperating with parts of said tubular members to afford current conducting means for the heater circuit, a switch interposed in said connections and closed by said movable member upon movement thereof to said predetermined position, independently operable devices arranged for simultaneous control by one hand, one for opening the switch when the valve is in open position and another for moving the valve opening member to said predetermined position, and means for returning the valve opening member to normal position upon releasing the operating device for moving it to said position.

10. A syringe comprising a tubular casing and associated inner and outer tubular body members one within the casing and another movable therein and extending therefrom, a nozzle on the last mentioned body member movable therewith, said body members having fluid passages therethrough for the discharge of the fluid to the nozzle, a valve normally closing the fluid passage of the inner body member, the valve being opened by movement of the outer body member inwardly of the casing, an electric heater for the fluid within the outer body member, circuit connections cooperating with parts of said tubular body members to afford current conducting means for the heater circuit, and a switch interposed in said connections and closed by movement of said outer body member to a predetermined position within the casing upon movement of said member to open the valve.

11. A syringe comprising a tubular casing and associated inner and outer tubular members one

within the casing and another movable therein and extending therefrom, a nozzle on the last mentioned member, said members having fluid passages therethrough for the discharge of the fluid to the nozzle, a valve normally closing the fluid passage of the inner member, the valve being opened by movement of the outer member inwardly of the casing, an electric heater for the fluid within the outer member, circuit connections cooperating with parts of said tubular members to afford current conducting means for the heater circuit, a switch interposed in said connections and closed by movement of said outer member to a predetermined position within the casing upon movement of said member to open the valve, means for moving the outer tubular member in opposite directions within the casing, and a device operable from the exterior of the casing to open the switch when the valve is in open position.

12. A syringe comprising a plurality of detachably associated unitary body sections having a passage for the fluid, one of said body sections being supported for movement longitudinally on another from a normal position to a predetermined position, a valve normally closing said passage, said valve being opened by said movable body section when moving it from normal position to said predetermined position, an electric heater for the fluid carried by one of the body sections, two of said sections having self-contained circuit connections cooperating therewith to form a portion of and to complete the heater circuit upon movement of the valve to open position by said movable body section, the circuit being broken by the return of said movable body section to normal position, and means for returning said section to normal position.

13. A syringe comprising a plurality of detachably associated unitary sections having a passage for the fluid, one of said sections being supported for movement on another from a normal position to a predetermined position, a valve normally closing said passage, said valve being opened by said movable section when moving it from normal position to said predetermined position, an electric heater for the fluid carried by one of the sections, said sections having self-contained circuit connections cooperating with the sections to form a portion of the heater circuit, the connections of two of the sections being spaced one from another when the valve is in closed position and one being movable to engage the other to close the heater circuit upon moving said movable section from normal position to valve opening position, and means operable to separate said last mentioned connections when the valve is in open position whereby to open the heater circuit.

14. A syringe comprising a plurality of detachably associated relatively movable unitary body sections having a passage therethrough for the fluid, a valve operating to close said passage in the normal position of the body sections, and opened by movement of the sections one relative to another, an electric heater for the fluid carried by one of the body sections, said sections having self-contained circuit connections cooperating with the sections to form a portion of the heater circuit, a normally open switch interposed in said connections, said switch being closed upon effecting relative movement between the body sections to open said valve and being opened when the body sections are returned to normal position, means for returning the sections to normal position, and means for opening the switch when the valve is in open position.

15. A syringe including a casing, a plurality of detachably associated unitary tubular sections within the casing adapted for the passage of the fluid therethrough one of said body sections being movable longitudinally of the casing, said sections having self-contained circuit connections for cooperation with the sections and the casing to form a portion of an electric circuit for transmitting current for heating: the fluid, switch means for closing the circuit operated by movement of said body section relative to said casing, when the body section is at a predetermined position, and means associated with the switch means for opening the circuit when said body section is at said predetermined position.

16. A syringe comprising telescoping housing members, one projecting from and movable longitudinally of another, said members being adapted for the passage of the fluid therethrough, valve means supported within one of said members for controlling the flow of the fluid and actuated by movement of one of the members to a predetermined position relative to another, and electric heating means for the fluid disposed within one of said housing members and having a switch closed by movement of one of said members upon effecting relative movement of said members to operate the valve means.

17. A syringe comprising telescoping housing members movable one longitudinally of another and adapted for the passage of the fluid therethrough, a valve for controlling the flow of the fluid and supported within one of said members and operated by movement of one to a predetermined position relative to another, electric heating means for the fluid supported by one of said members and having a switch closed by movement of one of the members upon effecting relative movement of the members to open the valve, and an operating device mounted on one of said members and operable to open the switch when the valve is in open position.

18. A syringe comprising telescoping housing members movable one longitudinally of another and adapted for the passage of the fluid therethrough, a valve for controlling the flow of the fluid carried by said members and opened by one of said members when moving it to a predetermined position relative to another, electric heating means for the fluid supported by one of said members and having a switch including normally spaced contacts one of which is moved to engage the other of said contacts when effecting relative movement of said members to operate the valve, and manually operable devices arranged for simultaneous control by one hand, one for effecting relative movement of said members to open the valve and another operable to open the switch while the valve is in open position.

19. A syringe comprising relatively movable telescoping housing members adapted for the passage of the fluid therethrough, a valve within one of said members for controlling the flow of the fluid through said members and opened by the movement of one relative to another, electric heating means supported within one of said members for heating the fluid discharging therethrough, said electric heating means having a switch closed by one of said members when moving it relative to another subsequent to the opening of the valve, and means on one of said members for opening the switch while maintaining the valve in open position.

20. A syringe including a plurality of unitary detachably associated housing sections free to move one longitudinally on another and adapted for the passage of fluid therethrough, electric circuit connections self-contained on said sections, respectively, and comprising normally spaced contacts engaged one with another upon movement of one of said housing sections longitudinally of another, and heating means included in the circuit.

21. A syringe including a plurality of unitary detachably associated housing sections free to move one longitudinally on another and adapted for the passage of fluid therethrough, said housing sections having self-contained electric circuit connections separable from one another with said sections, the sections and the connections thereof jointly forming a portion of an electric circuit for transmitting current for heating the fluid, normally open switch means for controlling the circuit closed by movement of one of said housing sections longitudinally of another, and valve means for controlling the flow of the fluid.

22. A syringe including a plurality of unitary detachably associated tubular body sections, one of said sections being free to move longitudinally on another and adapted for the passage of the fluid therethrough, said sections having self-contained electric circuit connections and one of the sections including electric heating means for the fluid, the sections and the circuit connections and heating means jointly forming a portion of an electric circuit, and switch means for controlling the circuit operated by movement of one of said body sections on another.

23. A syringe including a casing, a plurality of unitary detachably associated tubular sections within the casing and adapted for the passage of the fluid therethrough, one of said sections extending from and being movable within the casing longitudinally thereof and on another of said sections, said sections having self-contained circuit connections for cooperation with the sections and the casing to form a portion of an electric circuit for transmitting current for heating the fluid, and switch means for controlling the circuit operated by movement of one of said sections longitudinally of the casing.

24. A syringe including a plurality of unitary detachably associated tubular body sections free to move one longitudinally on another and adapted for the passage of the fluid therethrough, electric circuit connections self-contained on said sections, respectively, and including contacts movable one into engagement with another upon moving one of said sections to a predetermined position relative to another, valve means for controlling the flow of the fluid through the sections, and means for separating said contacts while said sections are at said predetermined position one relative to another.

25. A syringe comprising tubular body members for the passage of the fluid, one movable from normal position to a predetermined position relative to another, a tubular section rotatably connected with one of said body members, a fluid supply conduit connected with said tubular section for rotation therewith, a valve normally closing said tubular section, said valve being opened by said movable body member during movement thereof to said predetermined position, and electric heating means for the fluid connected with one of said tubular body members and including a switch having normally spaced contacts, one cooperating with another to close the circuit when said movable body member is at said predetermined position, one of said contacts being rotatable in engagement with another by said tubular section upon rotation of the latter with said movable body member at said predetermined position.

26. A syringe comprising a pair of tubular body members one movable on and relative to another and one having a nozzle, a tubular section for supplying fluid to the nozzle, said section being rotatably connected with one of said body members, a valve normally closing said tubular section, said valve being responsive to the movable body member upon movement of the latter in one direction, means adjustable on one of the body members for cooperation with the other to vary the extent of movement of the valve when opening the latter whereby to regulate the flow of the fluid to the nozzle, and electric heating means for the fluid connected with one of said tubular body members and including a switch having normally spaced contacts one being positioned by the movable body member to engage another when said body member is moved to a predetermined position to open the valve.

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