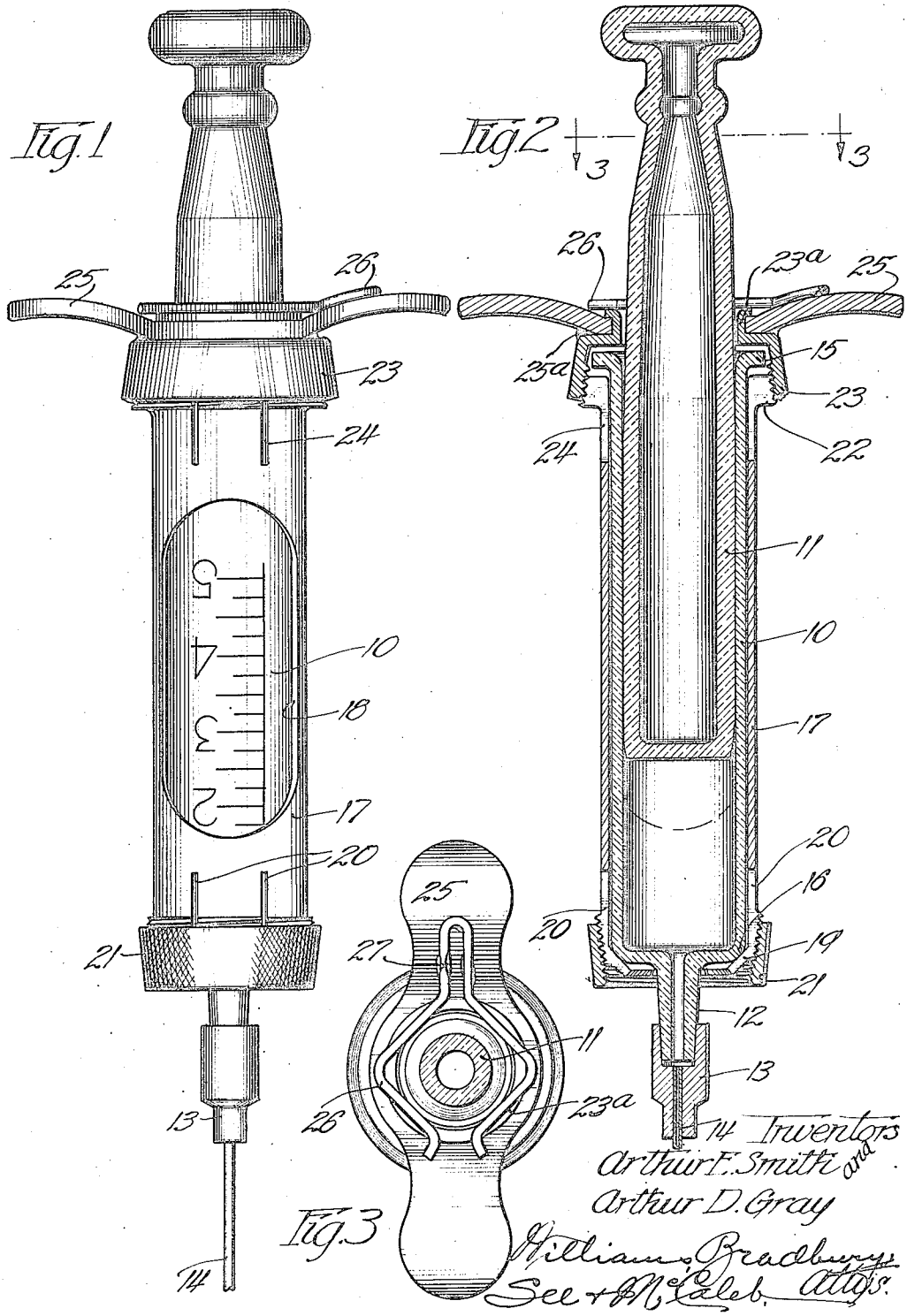
May 29, 1923. 1,456,717

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HYPODERMIC SYRINGE

Filed April 7, 1921 2 Sheets-Sheet 1



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Fig. 4

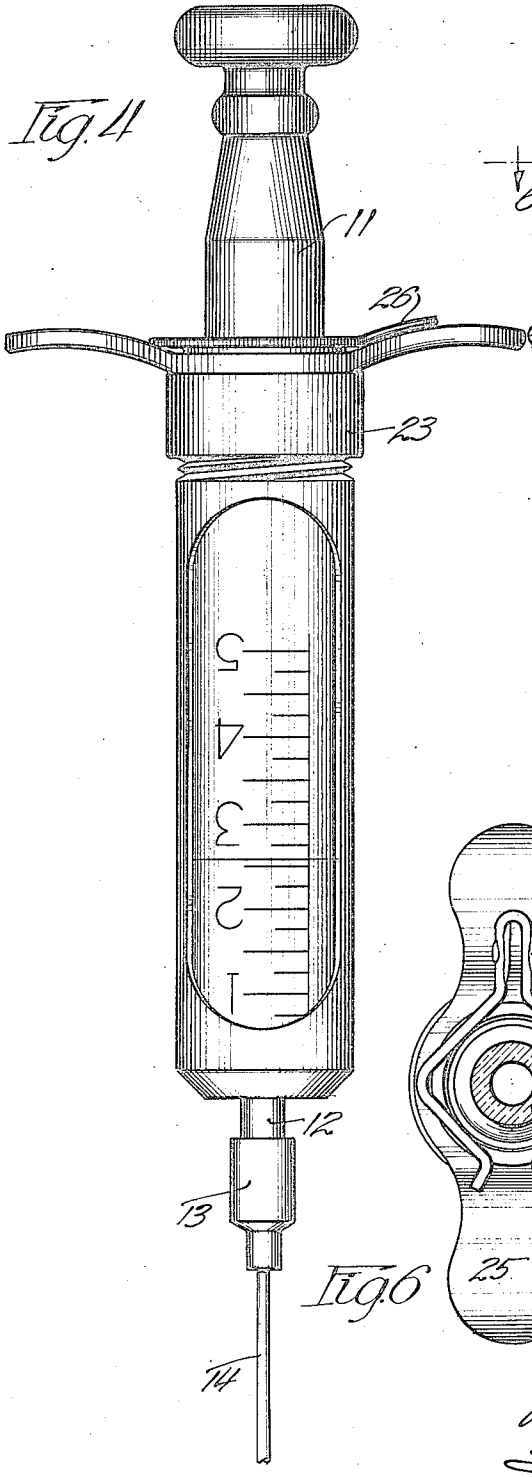


Fig. 5

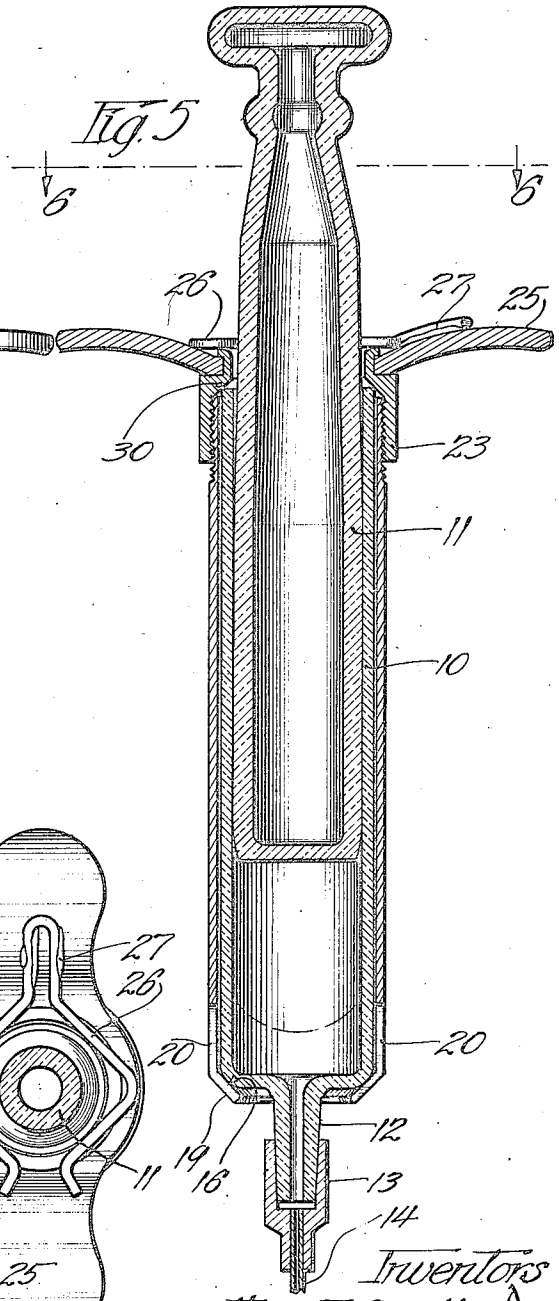


Fig. 6

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UNITED STATES PATENT OFFICE.

ARTHUR E. SMITH AND ARTHUR D. GRAY, OF CHICAGO, ILLINOIS.

HYPODERMIC SYRINGE.

Application filed April 7, 1921. Serial No. 459,354.

To all whom it may concern:

Be it known that we, ARTHUR E. SMITH and ARTHUR D. GRAY, citizens of the United States, and residents of Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Hypodermic Syringes, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

Our invention relates to hypodermic syringes especially adapted for use by dentists or physicians, and contemplates certain improvements in those types of syringes which comprise glass barrels and preferably glass plungers.

The embodiments of our invention herein illustrated are particularly characterized by certain fenestrated metal frames which house and protect the barrels, and carry the finger pulls.

The frame in each case is so conformed and related to the glass barrel of the syringe that the strains to which the barrel is subjected in the operation of the syringe are applied at such points and in such manner that danger of breakage of the barrel, or any part thereof, due to such strains, is eliminated. The frame or shell in each case comprises novel means for attaching it to the syringe barrel with which it is associated, the attaching devices being designed to accurately center the barrel within the frame when the frame and barrel are assembled and fastened together. The inner diameter of the frame is preferably larger than the outer diameter of the glass barrel, and the devices for attaching the frame and barrel are releasable. By virtue of this arrangement, it is possible to sterilize the several parts in hot water without danger of breakage of the several parts due to the different co-efficients of expansion of the glass and metal.

Other objects and advantages of our invention will appear as the following detailed description progresses.

In the drawings illustrating our invention,

Figure 1 is a side elevation of a syringe embodying our invention;

Figure 2 is an axial sectional view of the device shown in Figure 1;

Figure 3 is a section taken on line 3—3 of Figure 2;

Figure 4 is an elevational view of a modified embodiment of our invention;

Figure 5 is an axial sectional view of the device shown in Figure 4; and

Figure 6 is a section taken on line 6—6 of Figure 5.

Similar characters of reference refer to similar parts throughout the several views.

Referring first to Figures 1 to 3, it will be noted that the syringe comprises a glass barrel 10, within which operates the hollow glass plunger 11, the inner cylindrical surface of the barrel and the outer cylindrical surface of the plunger being ground to fit, in accordance with the usual practice. At its lower end the barrel is provided with a nozzle 12, the outer surface of which is ground so that it may have a conical fluid-tight fit with the needle cap 13. The needle is indicated at 14. The barrel shown in Figures 1 to 3 is provided with an upper flange 15, and the shoulder at the lower end of the barrel is rounded as indicated at 16. As will hereinafter appear, we avail ourselves of the rounded shoulder 16 in securely, but releasably, attaching the fenestrated frame of our syringe to the syringe barrel. The barrel is furthermore provided with volumetric scale markings as shown.

Those parts of the syringe thus far specifically described do not differ particularly from syringes of the glass barrel and plunger type now in general use. It is the usual practice to provide a collar which encircles the syringe barrel and lies against the under surface of the flange 15, the collar being provided with lateral extensions which serve as finger pulls. This arrangement affords the barrel no protection whatsoever against accidental breakage by dropping, etc., and is furthermore unsatisfactory because upward pressure exerted upon the finger pulls tends to break the flange 15 which, being of glass and necessarily of limited cross section, is incapable of withstanding any considerable force directed against its under surface. Our invention overcomes the shortcomings of the commonly employed arrangement just described, and in addition affords other advantages not hitherto afforded by any of the syringes of the type to which our invention relates.

We prefer substantially to enclose the barrel of the syringe within a metal sheath, and with this object in view we provide the metal frame 17, the frame being fenestrated as in-

dicated at 18 to reveal the scale markings on the syringe barrel. The inner diameter of the frame is preferably somewhat larger than the outer diameter of the barrel so that when the frame attachments are loosened as hereinafter described the barrel will be free to expand and contract during and after sterilization in hot water. It is moreover desirable to have the inner diameter of the frame slightly larger than the outer diameter of the barrel, because it is very difficult to have the last mentioned diameter absolutely uniform. The frame is provided at its lower end with an inclined annular lip 19, the inner surface of which bears against the barrel shoulder 16. The lower end of the barrel is provided with a plurality of slits 20—20, and the several tongues afforded by the provision of these lips may be forced inwardly by an internally tapered milled nut 21, which co-operates with the threads formed upon the tapered lower end of the frame. The frame is provided at its upper end with a tapered flange 22, which is adapted to co-operate with the reversely tapered internal threads of cap 23. The upper end of the frame is provided with a plurality of slits 24—24. It will be understood that when nut 23 is threaded down upon the several sections of flange 22, the tongues afforded by slits 24—24 will be forced inwardly against the upper cylindrical surface of the barrel. The cap carries the bar 25 which is fitted around the hollow boss 23^a, which projects upwardly from cap 23, and is turned over the bar. The bar, which affords the usual finger pulls, may be either fixed or rotatable with respect to the cap, and is here shown as being fixed to the cap by solder, indicated at 25^a. When the bar is fixed to the cap, the ends of the bar serve as wings which facilitate threading the cap on and off of the shoulder 22. In any case where the bar is made rotatable with respect to the cap the latter is preferably externally milled.

Carried on the upper surface of the bar 25 is a wire spring 26 which is secured to the bar by any suitable means, as for instance by solder 27, and which has its legs conformed to bear frictionally against the glass plunger 11. The preferred conformation of the spring is the one illustrated, this arrangement enabling each leg of the spring to engage the plunger at two points. It is, of course, the function of the spring to retain the plunger in any adjusted position within the barrel.

When the fenestrated frame and its several attachments are assembled upon the syringe, as illustrated in Figures 1 and 2, the several tongues formed by the slits at the upper and lower ends of the frame are pressed firmly into contact with the outer cylindrical surface of the glass barrel, and the lip 19 is pressed firmly against the rounded shoulder 16. Since the surface of the lip which engages the shoulder is conical, the lip automatically properly centers the lower end of the barrel within the frame when nut 21 is tightened upon shoulder 19.

When, in the normal operation of the syringe, pressure is exerted on the finger pulls, this pressure is transmitted to the barrel through the frame. The friction tongues afforded by the slits in the frame tend evenly to distribute the exerted pressure over the barrel in such fashion that any chance of the barrel breaking under such pressure is obviated. In any case, where the mere friction of the tongues against the cylindrical surface of the barrel is not sufficient to transmit to the barrel the pressure exerted against the finger pulls, the lip 19 transmits said pressure to the shoulder 16 which, being rounded, is to a greater extent than any other part of the barrel adapted to withstand the force applied.

Whenever it is desired to sterilize the syringe in hot water, the plunger is removed and the nut 21 and cap 23 are loosened, and the entire device is immersed in the water. With the nut and cap thus loosened, and the plunger removed, neither breakage nor distortion of parts will result, notwithstanding the fact that the glass and metal parts have different co-efficients of expansion.

In Figures 4 to 6 we have illustrated a modified embodiment of our invention, which is very effective and capable of being economically manufactured. In describing this device, we shall confine ourselves to a description of those parts of the device which are not found in Figures 1 to 3, or which are different in construction and arrangement from the corresponding parts shown in Figures 1 to 3.

The lower end of the fenestrated frame of Figures 4 to 6 is preferably provided with two diametrically opposite slits 20—20. The shoulder 19 and nut 21 of Figures 4 to 6 are eliminated, the pressure of the slitted lower end of the frame against the glass barrel being sufficient properly to hold the lower end of the barrel when the barrel shoulder is forced down against lip 19 in the manner presently to be explained. The flange is eliminated from the upper end of the glass barrel in this modification of our invention, the plain upper end of the barrel lying immediately adjacent an annular conical surface 30 which is formed in cap 23. The cap 23 and the upper end of the fenestrated frame are provided with ordinary co-operating screw threads. There are no slits in the upper end of the frame of this embodiment of our invention. The bar 25 similarly to the corresponding bar of Figures 1 to 3 may either be fixed to or rotatable with respect to the cap 23. When the cap 23 of the device

shown in Figures 4 to 6 is threaded upon the upper end of the frame, the annular conical surface 30 engages the upper end of the glass barrel and properly centers the same and forces the curved shoulder 16 of the barrel into tight engagement with the lip 19, the two sections of the lip yielding to a certain degree as the barrel is forced downwardly.

The fenestrated frame and attachments illustrated in Figures 4 to 6 comprise a less number of parts and are somewhat cheaper to manufacture than are the corresponding devices shown in Figures 1 to 3, hence for some classes of work the arrangement illustrated in Figures 4 to 6 is a preferred embodiment of our invention.

Having thus described our invention, what we claim is new and desire to secure by Letters Patent of the United States is:

1. In combination with a syringe comprising a glass barrel having a rounded shoulder at its lower end, a fenestrated frame fitting around the barrel and provided at its lower end with an inturned lip having a conical surface arranged to bear against said shoulder, longitudinal slits in the lower end of the frame dividing said lip into a plurality of sections, and means carried by the frame for holding the several sections of said lip tightly against the aforesaid rounded shoulder.

2. In combination with a syringe comprising a glass barrel having a rounded shoulder at its lower end, a fenestrated frame fitting around the barrel having a conical portion arranged to bear against said shoulder, a plurality of longitudinal slits in the lower end of the frame dividing said conical portion into a plurality of sections, and finger pulls carried at the upper end of said frame.

3. In combination with a syringe comprising a glass barrel having a rounded shoulder at its lower end, a fenestrated frame fitting around the barrel having a conical portion arranged to bear against said shoulder, a plurality of longitudinal slits in the lower end of the frame dividing said conical portion into a plurality of sections, a cap threaded upon the upper end of said frame, and finger pulls carried by said cap.

4. In combination with a syringe comprising a glass barrel provided at its lower end with a shoulder, a substantially cylindrical metal frame fitting around said barrel and provided at its lower end with an inturned lip arranged to bear against said shoulder, longitudinal slits in the lower end of said frame dividing said lip into a plurality of sections, a cap at the upper end of the frame arranged to prevent downward displacement of the frame, and finger pulls carried by said cap.

5. In combination with a syringe of the class described, a cylindrical fenestrated metal frame provided at its lower end with an inturned lip providing a conical surface arranged to engage at a region slightly removed from the cylindrical portion of said frame, a shoulder at the lower end of the barrel, and a cap carried at the upper end of the frame, the cap serving to prevent downward displacement of the frame, said inturned lip being slit so that it may yield when drawn tightly against said shoulder.

6. In combination with a syringe including a glass barrel, a fenestrated frame fitting around said barrel, an inwardly tapering flange at one end of said frame, and slits in said flange dividing it into a plurality of sections whereby said barrel is resiliently engaged.

7. In combination with a syringe including a glass barrel, a fenestrated frame fitting around said barrel, longitudinal slits in said frame at the end thereof dividing the end of said frame into a plurality of sections, and clamping means about said sections for causing them to engage said barrel at points removed from the portion of said sections engaged by said clamping means.

8. In combination with a syringe including a glass barrel, a fenestrated frame fitting around said barrel, longitudinal slits in said frame at the end thereof dividing the end of said frame into a plurality of sections, and screw threaded clamping means engaging the outer surface of said sections and causing portions of them not directly engaged by said clamping means to engage said barrel.

In witness whereof, we hereunto subscribe our names as follows, April 4th, 1921.

ARTHUR E. SMITH.
ARTHUR D. GRAY.

Witnesses:
ALBIN C. AHLBERG,
EMILE J. BOURGEOIS.