

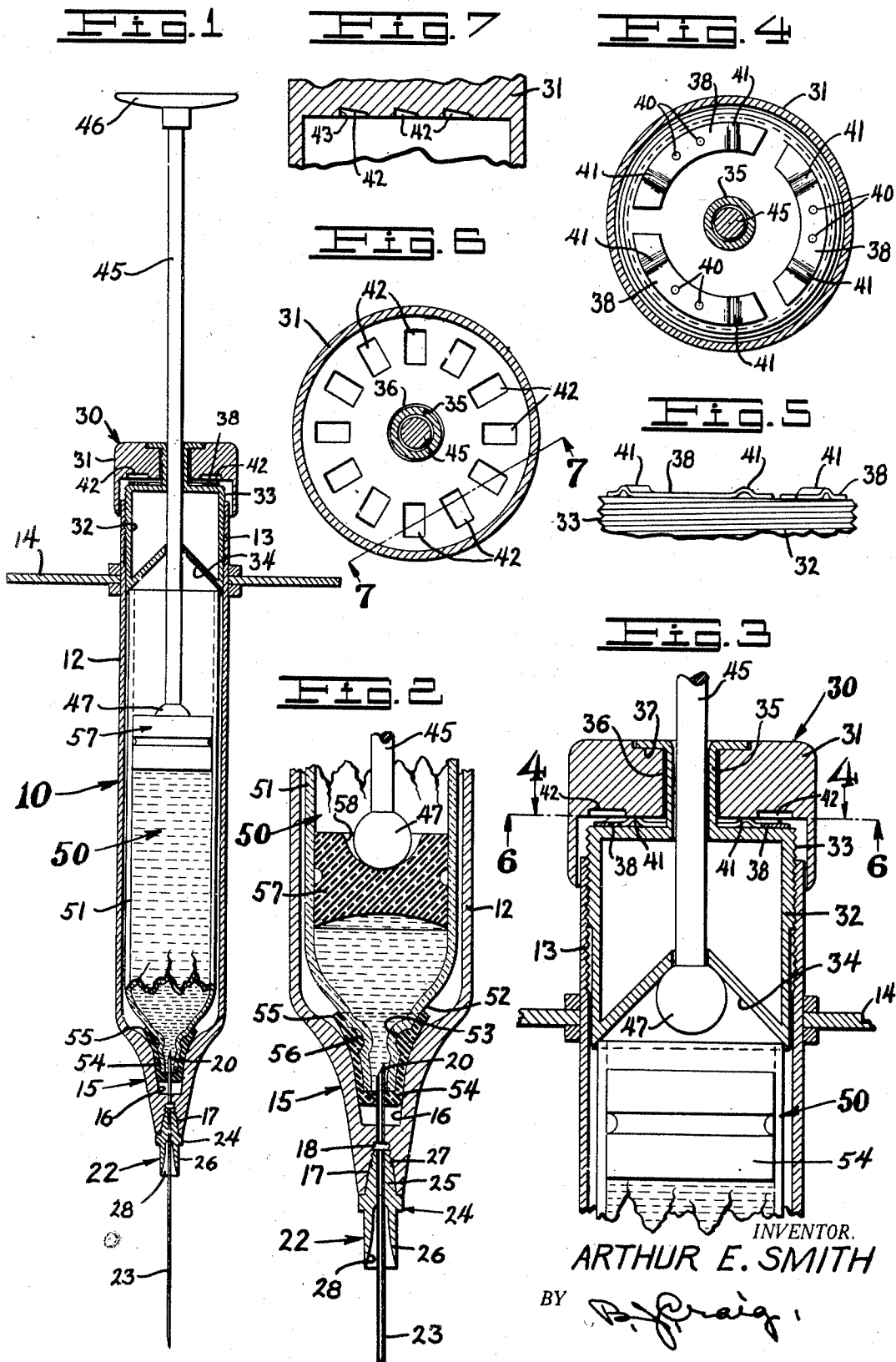
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A. E. SMITH

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HYPODERMIC SYRINGE

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## UNITED STATES PATENT OFFICE.

ARTHUR E. SMITH, OF LOS ANGELES, CALIFORNIA.

## HYPODERMIC SYRINGE.

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This invention relates to improvements in hypodermic syringes.

The general object of this invention is to provide a syringe wherein the substance to be ejected is contained in a cartridge-like ampule which is adapted to be automatically and correctly positioned in a novel manner in the syringe.

A further object of my invention is to provide an ampule syringe with a closure for the rear end of the syringe which is provided with means to prevent fracture of the ampule when the closure is tightened.

Another object of this invention is to provide a syringe ampule with improved means for sealing the ampule contents therein by coacting with a portion of the syringe.

A further object of this invention is to provide an improved needle for use with a hypodermic syringe.

An additional object of my invention is to provide a novel stopper for an ampule.

Other objects of this invention will be apparent from the following description taken in connection with the accompanying drawings wherein:

Fig. 1 is a central longitudinal section through my improved syringe showing an ampule operatively positioned therein.

Fig. 2 is an enlarged fragmentary central longitudinal section of the discharge end of the syringe and ampule.

Fig. 3 is a greatly enlarged fragmentary central longitudinal section of the loading end of the syringe.

Fig. 4 is a section taken on line 4—4 of Fig. 3 looking in the direction of the arrow and showing the resilient ratchet.

Fig. 5 is an enlarged side elevation of the resilient ratchet shown in Fig. 4.

Fig. 6 is a section taken on line 6—6 of Fig. 3 looking in the direction of the arrows and showing the ratchet notches, and

Fig. 7 is an enlarged section taken on line 7—7 of Fig. 6.

Referring to the drawings by reference characters I have indicated a hypodermic syringe embodying the features of my invention generally at 10. This syringe comprises a hollow body portion or barrel 12 having screw threads 13 at one end and having a finger grip cross bar 14 adjacent the screw threaded end.

The end of the syringe opposite the screw

threads 13 is formed into an integral reduced tapered tip 15 which includes a conical upper recess 16 and a lower conical recess 17 which is threaded as at 18 adjacent its apex.

A hollow needle 20 is shown as secured in the tip 15 as by soldering or in any other desired manner. One end of the needle 20 projects into the recess 16 and the opposite end is preferably flush with the bottom of the recess 17 thus forming a passageway from the recess 16 to the recess 17.

I have indicated generally at 22 one form of hypodermic needle which may be used in connection with my improved syringe. This hypodermic needle 22 includes a hollow needle portion 23 secured at one end to a hub 24 and sharpened at its opposite end.

The hub 24 includes a conically shaped tip 25 and a needle guard 26. The conical tip 25 is adapted to be positioned in the conical recess 17 of the syringe tip 15 and is provided with screw threads 27 which are adapted to engage the threads 18 in the recess 17 to detachably secure the hypodermic needle 22 to the syringe.

The needle guard 26 includes a central tapered recess 28, the side walls of which are spaced from the needle 23 to allow slight lateral movement of the needle 23 but restrict such movement before the arc of bend of the needle is great enough to break the needle portion 23 at its juncture with the hub 24.

The end of the syringe 10 is adapted to be closed by a cap which I have indicated generally at 30. This cap includes a head 31 and an ampule centering member 32. The member 32 includes a screw threaded portion 33 which is adapted to engage the threads 13 of the syringe barrel 12, a conical recess 34 at one end and a hollow hub 35 at the opposite end. The hub 35 extends through an aperture 36 in the head 31 and the end of the hub is spun over to form an end flange which fits within a recess 37 in the head. The head 31 and the centering member 32 are thus connected together but are rotatable relative to each other.

Interposed between the head 31 and the member 32 I provide ratchet segments 38 which are secured to the top 39 of the member 32 as at 40 and include upstruck ridges as clearly shown in Figs. 3, 4 and 5. These

ratchet segments 38 are preferably made of a high grade of spring steel. The upstruck ridges 41 of the segments 38 are adapted to be normally positioned in notches 42 formed in the head 31 (see Figs. 3, 6 and 7).

As shown in Fig. 7 the notches 42 are so formed that should the centering member 32 meet with undue resistance as it is being inserted in the syringe barrel the ridges 41 on the segments 38 will flatten and allow the head to turn independent of the centering member. When the centering member is being removed from the syringe barrel the ridges 41 abut the vertical portions 43 of the notches 42 and considerable more restraint on the part of the centering member is required before the head will turn independent of the centering member, thus assuring of the removal of the cap 30 at all times.

The cap 30 also includes a plunger rod 34 which is freely movable through the hub 35 and the member 32. The plunger rod 34 as shown includes at one end an enlarged thumb piece 46 and at the opposite end an enlarged spherical head 47.

The improved ampule which I have shown used in connection with my improved syringe 10 is indicated generally at 50 and includes a body portion 51 provided at one end with a tapered neck 52 in which is provided a peripheral groove 53. The end of the tapered neck 52 is left open and is adapted to be closed by a resilient cap 54 (see Figs. 1 and 2).

The cap 54 is preferably made of a good grade of rubber and may include a skirt portion 55 which is adapted to surround a portion of the tapered neck 52 and is provided with an internal bead 56 which is adapted to fit within the grooves 53 in the tapered neck of the ampule to retain the cap on the ampule.

The end of the ampule body 5 opposite the tapered neck 52 is shown as adapted to be closed by a stopper 57 which is normally spaced adjacent the end as shown in Fig. 3, and is adapted to be moved within the ampule body. This stopper 57 is preferably made of a good grade of rubber and includes a semi-spherical recess 58.

When it is desired to make an injection with my improved syringe 10 the cap 30 is removed and the ampule 50 positioned in the barrel 12 so that the resilient cap 54 of the ampule is positioned in the tapered recess 16 of the tip 15. As the ampule is thus positioned the needle 20 punctures the end of the cap 54 and enters the ampule as clearly shown in Figs. 1 and 2. The cap 30 is then again operatively positioned on the barrel 12 and screwed thereinto until the end of the ampule abuts the side walls of the conical recess 34 in the centering member 32 as shown in Fig. 3. As the member 32 is

moved towards the ampule the adjacent end of the ampule enters the conical recess and is automatically correctly positioned in the syringe barrel thereby. In screwing the cap 30 into the barrel the head 31 is grasped in the fingers of the operator and turned to the right. In so doing the head 31 will, through the medium of the resilient ratchet segments 38 and notches 42, turn the centering member 32.

After the centering member has engaged and correctly positioned the ampule in the barrel the ridges 41 of the resilient ratchet segments will, upon further movement of the head, flatten and allow the head to turn without turning the centering member and thus the centering member cannot be forced against the ampule sufficiently to fracture the ampule.

The plunger rod 45 is then moved towards the tip 15 until the head 47 is positioned in the recess 58 of the ampule stopper 57. Upon further movement of the plunger rod towards the tip 15 it will force the stopper 57 towards the tapered neck 52 of the ampule and cause the stopper to act as a piston to expel the contents of the ampule through the needle 20 and into the hypodermic needle 22.

The pressure required to move the stopper 57 to expel the contents of the ampule will wedge the cap 54 into the tapered recess 16 of the tip 15 and form a fluid tight seal between the end of the ampule and the syringe.

To remove the ampule from the syringe the plunger rod is moved towards the cap 30 until the head 47 abuts the centering member 32 as shown in Fig. 3. The head 31 of the cap 30 is then turned to the left and will, through the medium of the ratchet segments 38 and notches 42, turn the centering member 32 and unscrew it from the barrel 12.

From the above description it will be apparent that I have provided a novel form of hypodermic syringe which can be economically manufactured, which is simple in construction and highly efficient in use.

It will be understood that the barrel 12 and the tip 15 are preferably formed integral as by casting after which the casting is machined to the proper finish.

Having thus described my invention, I claim:

1. In a syringe adapted to receive an ampule, a barrel, a closure including an operating means and an ampule engaging member mounted to rotate on said operating means and means associated with said operating means to cause said operating means to rotate said engaging member at times.

2. In a syringe adapted to receive an ampule, a barrel, an operating member, an ampule engaging member mounted for movement on said barrel and means associated with said operating member and said ampule engaging member whereby movement of said

operating means actuates said engaging member to cause said engaging member to engage said ampule. by rotation of said head will cause said centering member to rotate. 35

3. In a syringe adapted to receive an ampule, a barrel, a closure cap for one end of said barrel, said cap including means for removably engaging said barrel and for engaging an ampule in said barrel and means on said cap operative when said cap is moved to limit the pressure between the engaging means and the ampule. 40

4. In a syringe adapted to receive an ampule, a barrel, a rotatable end for said barrel, said end including an ampule engaging portion, said barrel being threaded and said end having threads thereon to match the threads of said barrel, a member associated with said end and rotatable relative thereto and ratchet means associated with said end and said member whereby rotation of said end will cause said member to rotate. 45

5. In a syringe adapted to receive an ampule, a barrel, a tip at one end of said barrel, said tip including a conical recess and having means thereon for removably securing a hypodermic needle thereto, a closure cap for the opposite end of said barrel, said cap including a head and an ampule centering member, said barrel being threaded and said centering member having threads thereon to match the threads of said barrel, said head and said centering member being relatively rotatable, and resilient means connecting said head and said centering member where- 50

6. In a syringe adapted to receive an ampule, a barrel, a tip at one end of said barrel, said tip being formed integral with said barrel, said tip including a conical recess and having means thereon for removably securing a hypodermic needle thereto, a closure cap for the opposite end of said barrel, said cap including a head and an ampule centering member, said barrel being threaded and said centering member having threads thereon to match the threads of said barrel, said head and said centering member being relatively rotatable and ratchet means associated with said head and said centering member whereby rotation of said head will cause said centering member to rotate, a plunger rod associated with said closure cap, said plunger rod being movable relative thereto and including an enlarged spherical head at one end and an enlarged operating member at the opposite end. 55

7. For use in a syringe adapted to receive an ampule and having a barrel, a member including a cylindrical portion having a stem projecting from one end thereof, a closure carried by said stem, said stem having a flange thereon for retaining said closure, the other end of said cylindrical portion having an ampule engaging recess therein. 60

In testimony whereof, I hereunto affix my signature. 65

ARTHUR E. SMITH.