

July 1, 1924.

1,499,952

H. SPAHLINGER

AMPUL SYRINGE

Filed March 1, 1920

Fig. 1

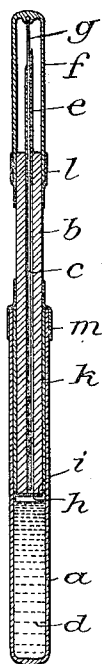


Fig. 2

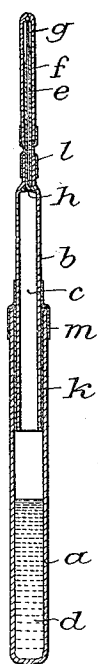


Fig. 3

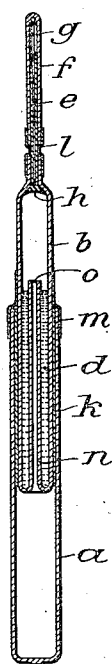


Fig. 4

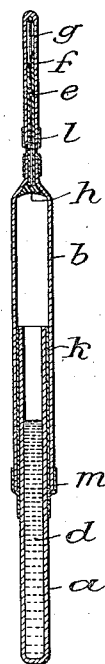


Fig. 5

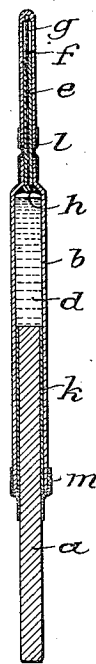
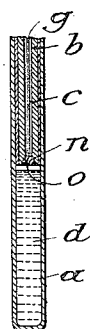


Fig. 6



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UNITED STATES PATENT OFFICE.

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AMPUL SYRINGE.

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To all whom it may concern:

Be it known that I, HENRY SPAHLINGER, a citizen of the Republic of Switzerland, residing at Carouge-Geneve, Switzerland, have invented certain new and useful Improvements in Ampul Syringes; and I do hereby declare the following to be a clear, full, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawing, and to letters or figures or reference marked thereon, which form a part of this specification.

The usual hypodermic syringes do not meet all the requirements with regard to sterility which must be expected from such instruments. The danger of infection and of communication of a disease from one person to another is not completely avoided in as much as one has often, for instance in times of epidemics, to apply injections to a number of individuals in quick succession, when it may often occur that the syringe cannot be sterilized at all before each injection or at least not with the care necessary for that performance.

The danger of causing an infection exists even with a well sterilized syringe if the liquid to be injected has to be drawn from an ampul by the syringe. Parts of that ampul have to be broken off in order to get at the liquid and during the process fragments of glass may get into the liquid and contaminate it.

In order to avoid the above mentioned drawbacks I construct ampul-syringes wherein a single dose of the liquid to be injected is permanently enclosed. A syringe of this kind consists of a receptacle for holding the dose of liquid to be injected, a hollow needle and means for preventing the air from coming into contact with the needle until at the moment of use. When using such an instrument said protecting means are taken off, the liquid injected and the whole instrument thrown away, as it is only to be used once. Such an ampul meets the requirements as to sterility but the constructions of these instruments hitherto known show other short-comings which exclude them from being generally used. The receptacles of some of these instruments have been made of tin or an alloy. They present the disadvantages that the state of the liquid contained in the metallic ampul

cannot be ascertained before use and further that a great many of the liquids to be used for injections cannot be kept in a metallic receptacle, as they are chemically decomposed by the metal. In other constructions of ampul-syringes the ampul is closed by a plug which has to be pushed into the receptacle just before injecting the liquid. It requires a special instrument to push the plug, which instrument is not always at one's disposal and it complicates the device and its use. Further, it is difficult to make the plug properly fit in the ampul. It must be a sliding fit, so that the plug can be moved comparatively easily without putting the glass ampul to too much strain when the plug has to act as plunger, and yet it should not let any of the liquid escape between the walls of the receptacle and the plug. It is a well known fact that with such instruments the same quantity escapes behind the plug as is injected through the needle.

The object of the present invention is to provide an instrument of the ampul-syringe type which combines all the advantages of the known constructions and which at the same time remedies all the above mentioned difficulties. To this end I make the ampul or receptacle for permanently enclosing the liquid to be injected of two members of rigid material preferably glass which may be telescoped in order to force the liquid through the needle. In this respect this ampul-syringe resembles the usual syringes, but it differs essentially from them in the manner of producing the sliding fit between the two members. Whereas in a syringe of the usual type the part acting as plunger is well ground into the tube that acts as container, this expensive way of producing the joint of the two parts cannot be adhered to in the case of ampul-injectors which are only to be used once and then thrown away. According to the present invention the two telescopic members do not fit closely into one another but have a reasonable amount of play producing a leaky or loose fit, and the annular space between them is filled with a plastic substance that makes a perfectly airtight joint and does not hinder the telescoping of the two members; in fact, it acts as a lubricant. This novel manner of sealing the members enables the use of ordinary glass tubes or rods which do not need to be of exactly the same diameter over their tele-

scoping length. The plastic packing substance provides for all the smaller variations in size which these parts are bound to have when they are not manufactured with special care and with that in view. Experiments carried out with the ampul injectors according to this invention have shown that the joint is perfectly tight even when the liquid is forced into a piece of cork of normal porosity.

Several modes of carrying the invention into effect are shown on the accompanying drawing in which—

Figs. 1 to 5 represent vertical sections through five different constructions of ampul-syringes.

Fig. 6 is a modified form of Fig. 1.

The ampul-syringe shown in Fig. 1 consists of the two parts, *a* and *b*, preferably of glass, the part *b* sliding inside *a* and the two forming together the ampul for holding the liquid *d*. *a* is a tube closed at the bottom and *b* a rod acting as a plunger, *a* being preferably made of a transparent material, while *b* may be made of any material. The rod *b* is provided with a capillary bore *c* along its center line, through which the liquid *d* passes when it is injected. A hollow injection needle *e* is provided at the outer end of plunger *b* and fixed to the end of bore *c*. The needle is protected from contact with the air by means of a cap *f* made of any material, which cap prevents any germs from contaminating the needle. A stillette *g* passes through the needle *e* and the bore *c*, is fixed at one end in the cap *f*, and the other end is just above a membrane *h* sealing the lower end *i* of the plunger *b* from the liquid.

A plastic substance *k* is placed between the tube *a* and the plunger *b*, making a perfectly tight joint. This paste is preferably a mixture of oil and paraffin. The liquid is prevented from escaping between the tube *a* and the plunger *b* when they are telescoped by said substance which also acts as lubricant and facilitates the sliding of part *a* over part *b*. The plunger need not exactly fit the tube, which circumstance considerably cheapens the manufacture.

The tube *a* and the cap *f* are sealed to the plunger *b* by means of rings *m* and *l* which may be made of any impermeable membraneous material. Such a sealed ampul-syringe may be stored for any length of time without becoming contaminated.

The liquid *d* may be introduced into the syringe by any known method.

The use of a transparent tube *a* provides the great advantage that the surgeon is enabled to judge from the appearance of the liquid inside whether it is still intact and fit for use or to reject it in case it does not fulfill requirements.

Fig. 6 is a modification of the apparatus

illustrated in Fig. 1 showing manner of closing of the bore of plunger *b*. For this purpose the bore is flared out to a conical opening which is closed by a plug of any material insoluble in the liquid to be injected; for instance, by a plug of wax, paraffin, cement, caoutchouc, etc.

When using an ampul-syringe illustrated in Fig. 1 the sealing ring *l* is detached first. Then the glass cap *f* is pushed towards the glass plunger *b* whereby the stillette *g* perforates the membrane *h* or pushes out a plug *o* Fig. 6 as the case may be, thus establishing communication between the liquid and the bore *c*. Then the sealing ring *m* is taken off as well as the cap *f*. The needle *e* is then inserted in the patient and the tube *a* is forced over the plunger *b* in the direction of the needle. Thereby the liquid *d* is pressed through the bore *c* and the needle *e* into the tissue of the patient. The total quantity of liquid is injected when the plunger reaches the bottom end of the tube.

I wish it to be understood that there is no necessity of the liquid completely filling the chamber between the tube and the plunger as is shown in Fig. 1; there may be an air space between the liquid level and the plunger.

Fig. 2 represents a modification of the ampul-syringe shown in Fig. 1. In this case the tube *b*, the diameter of which is somewhat smaller than that of tube *a* and which is inserted into the latter, acts as plunger. A needle *e* is fixed to the upper end of tube *b* and a protecting cap *f* having a stillette *g* surrounds the needle and is sealed to the tube *b* by a ring *l*. In the same manner as shown in Fig. 1 the annular space between the tube *a* and the plunger tube *b* is sealed with the paste *k* and tubes *a* and *b* are sealed together by a ring *m*. The bore leading to the needle is also closed by means of a plug *h*. This syringe is used in a similar manner to that described. The ring *l* is taken off first and in pushing the cap *f* towards the tube *b* and the plug *h* is removed to open the passage for the liquid to the needle. Then the ring *m* is removed and the syringe turned upside down, so that the needle is at the bottom. The liquid flows towards the needle and is forced through the latter by telescoping the tube *a* over tube *b* by which action the air inside the receptacle is compressed and forces the liquid through the needle into the patient.

The ampul-syringe illustrated in Fig. 3 is a modification of the construction shown in Fig. 2. It differs from the previous ampul-syringe in that the tube *b* acting as plunger is provided with an inner or re-entrant tube *n*, integral with tube *b*, the annular space between tubes *b* and *n* serving as a receptacle for the liquid. The tube

b is preferably made of a transparent material allowing the liquid to be seen, and tube *a* may be of any material. The method of using this instrument is exactly the same as that described for the instrument shown in Fig. 2. The ampul-syringe has also to be turned to the position in which the needle is directed downward; the liquid will then flow towards the needle and the forcing of tube *a* over tube *b* compresses the air inside *a*, the increased pressure being transmitted to the liquid through the bore *o* of tube *n*, all the other manipulations being the same as those described above.

The ampul-syringe illustrated in Fig. 4 is a modification of that shown in Fig. 2, the only difference is the arrangement of *a* as inner tube acting as plunger and *b* as outer tube, all the other parts and the manner of using them are the same as described with reference to Fig. 2.

Fig. 5 is a modification of Fig. 4. The tube *a* of Fig. 4 is replaced by a rod *a* acting as plunger. This syringe does not need to be inverted when being used, but may be used in any position.

I claim—

1. In an ampul syringe wherein the liquid to be injected is enclosed, an ampul for the liquid formed between two telescoping members, having a loose fit, a hypodermic needle carried by one member, a plastic sealing material between the telescoping members, and acting as a lubricant during the use of the syringe.

2. In an ampul-syringe an ampul, a telescoping member of non-uniform diameter and having a loose or leaky fit therewith, and a plastic sealing substance between the telescoping surfaces acting as a lubricant during use of the syringe.

3. In an ampul-syringe a piston member and a barrel member, having a loose or

leaky fit and a plastic sealing material of paraffine and oil between the telescoping surfaces.

4. In an ampul syringe two glass telescoping members one of which carries a hypodermic needle, there being a loose fit between said members, and a plastic sealing substance between the telescoping surfaces of the glass members, acting as a lubricant during the use of the syringe and as the sole means for preventing the escape of liquid between the members.

5. In an ampul syringe, an ampul member, a plunger member therefor, having a duct terminating in a hypodermic needle at one end and having at the other a re-entrant tube.

6. In an ampul-syringe of the type wherein the liquid to be injected is permanently enclosed, an outer tube, a second tube inserted in and adapted to telescope therein, a third tube arranged within the second tube and united to it at one end forming an annular space between them for the liquid, and a plastic sealing substance between the first and second tubes.

7. In an ampul-syringe wherein the liquid to be injected is enclosed, the combination with the ampul; of a telescoping straight tubular member slidable therein but whose irregularities of exterior diameter prevent it from fitting tightly in said ampul, said member having a longitudinal bore, a hypodermic needle forming an extension of said bore, and a destructible plastic sealing material between said ampul and member operating as the sole means of lubricating and effecting a liquid tight joint between the members during operation.

In testimony that I claim the foregoing as my invention, I have signed my name.

HENRY SPAHLINGER.