Aug. 20, 1929. C. E. BRE MILLER 1,725,177

SYRINGE

Filed June 17, 1926

Fig. 1.

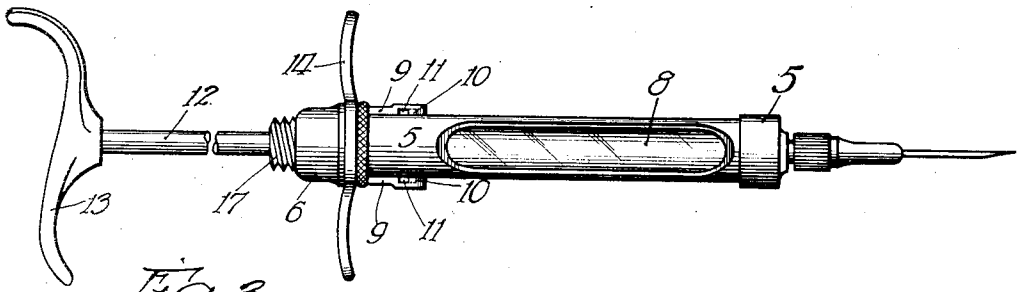


Fig. 3.

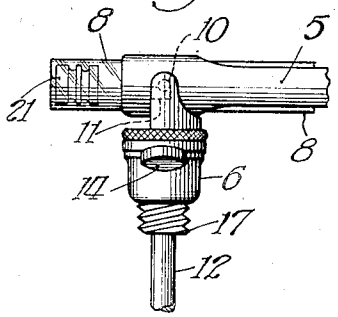


Fig. 4.

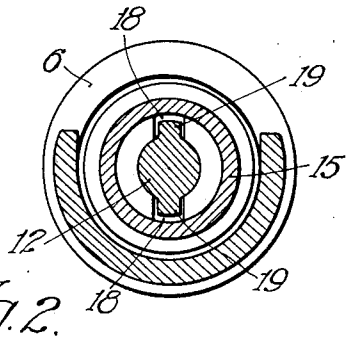


Fig. 2.

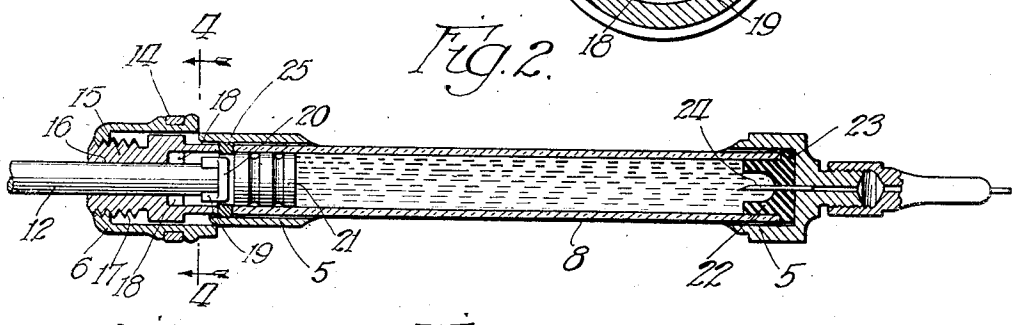


Fig. 5.

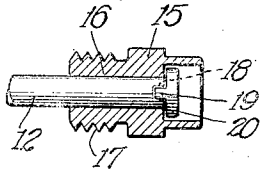
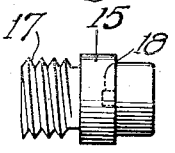


Fig. 6.



Inventor.
Clifford E. Bre Miller.
by Emery, Booth, Jennings & Varney,
Attorneys

Patented Aug. 20, 1929. 1,725,177

UNITED STATES PATENT OFFICE.

CLIFFORD E. BRE MILLER, OF CHICAGO, ILLINOIS, ASSIGNOR TO COOK LABORATORIES, INC., A CORPORATION OF DELAWARE.

SYRINGE.

Application filed June 17, 1926. Serial No. 116,547.

My present invention relates to hypodermic syringes, and aims to provide an improved hypodermic syringe of the cartridge type. More particularly my invention involves improvements over the prior art of breech loading cartridge syringes, features of the invention being applicable however to cartridge syringes not necessarily of the breech-loading type. My invention further involves improvements in connection with such syringes embodying or employing the plugged tube type of cartridge, and further the provision of a practicable and reliable cartridge syringe for use with plugged tube cartridges in administering hypodermic injections where high pressure is required, as for instance in administering intraosseous injections.

The invention may be understood by reference to one illustrative embodiment shown in the accompanying drawings, in which:

Fig. 1 is an elevation of the illustrative syringe;

Fig. 2 is a longitudinal section on an enlarged scale, omitting portions of the instrument;

Fig. 3 is a fragmentary view illustrating the opening of the syringe for refilling with a cartridge.

Fig. 4 is an enlarged section substantially on line 4—4 of Fig. 2;

Fig. 5 is a detail section showing the plunger rod engaged with the cartridge clamping member; and

Fig. 6 is an elevation of the cartridge clamping member.

Referring to the drawings, there is shown a cartridge syringe comprising a body, a medicament-containing cartridge held by the body, a needle or canula piercing one end of the cartridge and exemplifying an aseptic medicament conduit leading from the interior of the cartridge to the point of injection, and a plunger movable longitudinally of the syringe body for expelling the medicament.

In the illustrative construction, the syringe body consists of two hinged parts 5 and 6 relatively movable into and out of axial alinement so as to open the instrument at its breech end for insertion or withdrawal of the cartridge 8, and for closing the instrument for operative use. The syringe head 6 has two arms 9 embracing the end of the barrel part 5 and connected with said barrel by pivot pins 10 projecting from opposite sides of the barrel near one end, said pins extending into bayonet slots 11 formed in the inner faces of said arms. The described construction provides means whereby the syringe head 6 may be swung about the end of the barrel 5 and may be disengaged therefrom when desired.

The syringe plunger rod 12 is carried by and movable through the hinged syringe head 6 and is preferably slidable therein. At its outer end it is provided with an enlargement or handle 13 to facilitate pushing it inwardly during an injection; and on the syringe head there is the usual finger bar 14 which is used with the handle during an injection, and in this instance is swiveled on the syringe head.

In order to secure the hinged parts in alinement so that the plunger rod may eject the contents of the cartridge, a locking sleeve 15 is provided which is carried by the hinged head 6 and is projectible across the joint of the syringe so as to extend within the open end of the barrel part 5. The locking sleeve is of sufficient diameter to engage the rear end of the cartridge to clamp the same, as will be more fully described, and it has an axial bore 16 to permit the plunger rod 12 to slide through it.

In order to manipulate the locking member, it may be engaged by screw-threads 17 to the hinged head, as shown, and may be provided with one or more recesses 18 to receive complementary projections 19 extending laterally from the plunger rod adjacent its inner enlarged end 20. In this instance said locking member is recessed at its inner end to enclose the enlarged end 20 of the plunger rod, and the recesses 18 to be engaged by the projections 19 are formed at the base of the main recess of said locking member. When the plunger rod is moved backward as far as it will go and then turned, its projections 19 will move into the recesses 18, whereupon the locking sleeve is mechanically connected with the plunger rod and may be advanced within or retracted from the barrel end by turning said plunger rod. As the plunger rod has a handle providing a fairly high leverage, the turning of the locking screw is easily effected and a very considerable thrust may be exerted upon the cartridge to clamp it immovably.

The cartridge shown comprises a tubular body such for instance as a glass tube having a slidable plug 21 sealing one end and a recessed plug 22 sealing its opposite end, said recessed plug 22 being formed with a flange 23 overlying the end of the cartridge tube which is adjacent the canula 24. When the locking sleeve is advanced into locking position, it will force the cartridge forward so that its fore sealing plug 22 will be pierced by the canula and the flange 23 of the plug will be clamped between the end of the cartridge tube and the inner surface of the front syringe barrel head. Thus the cartridge is substantially rigidly clamped between end abutments therefor, so as to prevent outward movement of the flanged plug 22 during the fluid-ejecting operation, by the driving forward of the plug 21 by the plunger, even though there be high pressure within the cartridge.

In actual practice, it is most convenient to use cut sections of glass tubing to provide the tubular cartridge bodies, and such sections are sometimes uneven at the cut surfaces; and due to this unevenness and the brittleness of glass, the butt end of the glass cartridge tube, if too tightly engaged by the locking member, may chip and break off, possibly preventing use of the cartridge. To eliminate any likelihood of breaking the cartridge, a slightly resilient washer 25 (Fig. 2) may be interposed between the butt end of the cartridge tube and the clamping member. The washer may be fast to either the cartridge or the clamping member, or may be separate from both; whether fast or loose, its resiliency is sufficient to permit the heavy thrust of the clamping member to be transmitted to the end of the brittle cartridge body without danger of breakage.

It will be observed that the screw threaded locking member 15 is not only usable to hold the hinged parts of the syringe in alinement and to clamp the cartridge, but may also greatly facilitate piercing of the cartridge, by advancing the cartridge against the point of a previously positioned canula.

The clamping function of the screw member 15, whereby the cartridge is substantially rigidly clamped between said member and the abutment provided by the front head of the cartridge holding body or instrument, is advantageous to resist relative displacement between the cartridge tube and its fore sealing plug 22 during the fluid-ejecting operation, and especially when administering hypodermic injections under conditions where a high pressure is required, as for instance in making intraosseous injections. The high pressure imposed on the rear piston plug 21, and transmitted through the fluid contained in the cartridge to the fore sealing plug 22, would tend through reaction stresses to move the cartridge tube back or away from the fore plug. Hence the desirability of positively clamping the cartridge is apparent.

By virtue of the projections 20 of the plunger rod, engageable with the recesses 18 in the screw member 15, the plunger rod may be engaged with said screw member for operating the same by rotation of the plunger rod, either for advancing the screw to lock the instrument and to thrust forward and clamp the cartridge, or for retracting the screw to unlock the instrument; while at the same time the plunger rod is freely slidable in said screw member, so that there is no interference with the independent operation of the plunger rod to drive in the rear piston plug 21 and eject the fluid contents from the cartridge through the needle or canula piercing the fore cartridge plug. The operation of the screw by turning the plunger is convenient and, by virtue of the leverage obtained through the handle 13, enables the screw to be readily screwed tight to clamp the cartridge with considerably greater pressure than could readily be applied if the screw had to be operated directly by engaging a finger piece thereon with the fingers. My invention accordingly provides a very practicable, convenient and reliable syringe instrument for use with cartridges of the illustrated character in administering hypodermic injections, including intraosseous injections or other injections requiring high pressure.

Obviously the present invention is not restricted to the particular embodiment thereof herein shown and described, nor it is indispensable that all the features of the invention be used conjointly; they may be employed advantageously in various combinations and sub-combinations as defined in the claims.

What I claim is:

1. A syringe of the class described comprising, in combination, a body; a medicament cartridge held by the body; a plunger rod for expelling the contents of the cartridge; and means operated by turning the plunger rod for moving the cartridge longitudinally of the body.

2. A syringe of the class described comprising, in combination, a body; a medicament cartridge held by the body; a plunger rod for expelling the contents of the cartridge; and a member at the plunger rod end of the syringe having means engageable by cooperative means on the plunger rod, and being advanced into the body by rotation of the plunger rod when engaged therewith so as to clamp the cartridge.

3. A syringe of the class described comprising, in combination, a body; a medicament cartridge held by the body; a plunger rod for expelling the contents of the cartridge; and a sleeve engaged by screw

threads with the syringe end which is opposite from the needle end, and having means for engagement with the plunger rod so that the plunger rod may be used to advance it within the syringe body to clamp the cartridge in place.

4. A syringe of the class described comprising, in combination, a body; a medicament cartridge held by the body; a plunger rod for expelling the contents of the cartridge; said plunger rod having a handle at the outer end; and a screw threaded sleeve movable into the body from the plunger rod end thereof and engageable by the inner end of said plunger rod to effect rotation thereof to clamp the cartridge.

5. A syringe of the class described comprising, in combination, a body; a medicament cartridge held by the body; a plunger rod for expelling the contents of the cartridge; and means for moving the cartridge to clamp it within the body, said means engageable with the plunger rod end when the plunger rod is outermost to cause rotation thereof on turning the plunger rod, and being disengageable from the plunger rod by merely pushing inwardly thereon.

6. A syringe of the class described comprising, in combination, a body; a medicament cartridge held by the body; a plunger rod for expelling the contents of the cartridge; a screw-threaded sleeve for moving the cartridge within the body until it is clamped, said sleeve having an internal recess; the plunger rod having a handle at its outer end and a lateral projection near its inner end, the projection being engageable at will with the recess in the sleeve, so that the sleeve is easily rotated by turning the syringe handle.

7. A syringe of the class described, comprising, in combination, a body; a plunger rod movable longitudinally of the body; a medicament container held by the body comprising a tube having a pierceable sealing plug in its fore end and being constructed and arranged to have its interior volume reduced by the plunger rod to expel the medicament; said body having an abutment for said plug and means operable by the plunger rod to move the container longitudinally of the body and to clamp it substantially rigidly or non-yieldingly with said plug against said abutment so that the plug cannot be forced out by the hydrostatic pressure created within the container during an injection, the plunger rod being engageable with said means to operate the same to clamp the cartridge and being independently slidable to operate said container.

8. A syringe of the class described comprising, in combination, a syringe body; a plunger rod slidable on the syringe body; a medicament containing cartridge consisting of a cylindrical body; a plug sealing one end thereof and slidable therethrough and a flanged plug sealing the other end but not slidable, so that it may be pierced by the needle of the syringe without displacement; and means operable by turning the plunger rod to move the cartridge longitudinally of the syringe body and to clamp its flanged plug so that said plug is not forced out by the hydrostatic pressure of an injection.

9. A syringe of the class described comprising, in combination, a syringe body having a hinged head which, when swung to one side, exposes an opening in the body; a medicament containing cartridge held by the body and insertible in and removable through said opening; needle securing means; a member carried by the hinged syringe head and projectable across the joint between the head and the body of the syringe to lock said parts in operative position; a plunger rod carried by the syringe head and slidable through said locking member; and interengaging means on the locking member and plunger rod so that said rod may move the locking member from inactive to active position and vice versa.

10. A syringe of the class described comprising, in combination, a syringe body having a hinged head which, when swung to one side, exposes an opening in the body; a medicament containing cartridge held by the body and insertible in and removable through said opening; needle securing means; a member carried by the hinged syringe head and projectable across the joint between the head and the body of the syringe to lock said parts in operative position; said member being screw threaded in the syringe head and having an axial bore; a plunger rod having a handle at its outer end and slidable through the axial bore of the locking member; and means on the inner end of the plunger rod for connecting it to the locking member to actuate the same.

11. A syringe comprising a body portion and a head hinged thereto, a plunger reciprocable with respect to said head, a member engaging said head and movable with respect thereto to lock said head in operative position with respect to said body portion, said member being apertured for passage of said plunger, and means associated with said plunger and member whereby they may be releasably connected so that said member may be moved by the plunger to and from locking position.

12. A syringe comprising a body portion and a head hingedly attached thereto, a plunger, a locking member threadedly engaging said head, said head and member being apertured for passage of said plunger, said member being operable by said plunger to move into and out of position locking said head in operative relation to said body portion.

13. In a cartridge-syringe, a cartridge holding and operating instrument having a cartridge-piercing canula at its fore end and a plunger in its breech end, said instrument constructed to permit opening for insertion of the cartridge and embodying thrust means operable by the plunger to push against the butt end of the cartridge and force it to its forward position, the plunger being connectable with said thrust means to operate the same to push the cartridge forward and being readily releasable therefrom to permit independent forward movement of the plunger to operate the cartridge.

14. In a cartridge-syringe, a cartridge holding and operating instrument having a cartridge-piercing canula at its fore end and a plunger in its breech end, said instrument constructed to permit opening for insertion of the cartridge and embodying thrust means operable by the plunger to push against the butt end of the cartridge and force it to its forward position, the plunger and thrust means having cooperative means whereby the thrust means may be operated by turning the plunger while the plunger is independently longitudinally movable to operate the cartridge.

15. In a cartridge-syringe, a plunger-carrying cartridge-holding and operating instrument embodying relatively longitudinally movable abutments for the fore and rear ends of the cartridge and means operable by the plunger to cause a firm clamping of the cartridge by and between said end abutments, the plunger being connectable with said means for operating the same and releasable therefrom to permit independent operation of the plunger to operate the cartridge.

16. In a cartridge-syringe, a plunger-carrying cartridge-holding and operating instrument embodying relatively longitudinally movable abutments for the fore and rear ends of the cartridge and means operable by the plunger to cause a firm clamping of the cartridge by and between said end abutments, said means being operable by rotating the plunger and the plunger being independently longitudinally movable to operate the cartridge.

17. In a cartridge-syringe, a cartridge-holder having a cartridge-piercing canula at its fore end and having a breech head displaceable to permit endwise insertion of the cartridge; a hollow screw mounted in said breech head and adapted to be screwed therein against the butt end of the cartridge to thrust it forward and insure piercing by the needle; and a cartridge-operating plunger engageable with said screw to operate the same and slidable in said screw to operate the cartridge.

18. In a cartridge syringe, a cartridge-holder having a hinged breech head, a hollow screw in said head cooperable with the body of the holder to lock the head in place, and adapted to be unscrewed to permit swinging the head laterally to allow endwise insertion of the cartridge; and a cartridge-operating plunger slidable in said screw, said plunger and screw having cooperating means whereby the screw may be operated by turning the plunger.

19. In a cartridge-syringe, a jointed cartridge-holding and operating instrument having a cartridge-operating plunger and adapted to be opened for insertion of the cartridge and to be closed for operative use, said instrument comprising hinged or pivotally-connected parts adapted to be relatively displaced for opening the instrument and having an axially-adjustable locking screw, in which the plunger works, cooperable with the said parts to hold the instrument closed, said screw and plunger having cooperable means by which the screw may be operated by the plunger.

20. In a cartridge-syringe, a breech-loading cartridge-holding and operating instrument, jointed to permit swinging its rear portion relative to its front portion for opening the instrument to permit insertion or withdrawal of the cartridge; said front portion embodying an abutment for the fore end of the cartridge and adapted to accommodate a cartridge-piercing canula; and a hollow screw and plunger carried by said rear portion, said plunger freely slidable in said screw, and the screw and plunger having cooperating means whereby the screw may be rotated by turning the plunger; said screw adapted to bridge the jointed parts of the instrument to lock the same in closed condition and to bear on the butt end of the cartridge and thrust it forward against said abutment.

21. In a cartridge-syringe, a jointed cartridge-holding and operating instrument, adapted to be opened for introduction of a cartridge and to be closed for operative use, said instrument embodying a cartridge-operating plunger and an associated screw operable by the plunger to lock the instrument closed.

In testimony whereof, I have signed my name to this specification.

CLIFFORD E. BRE MILLER.