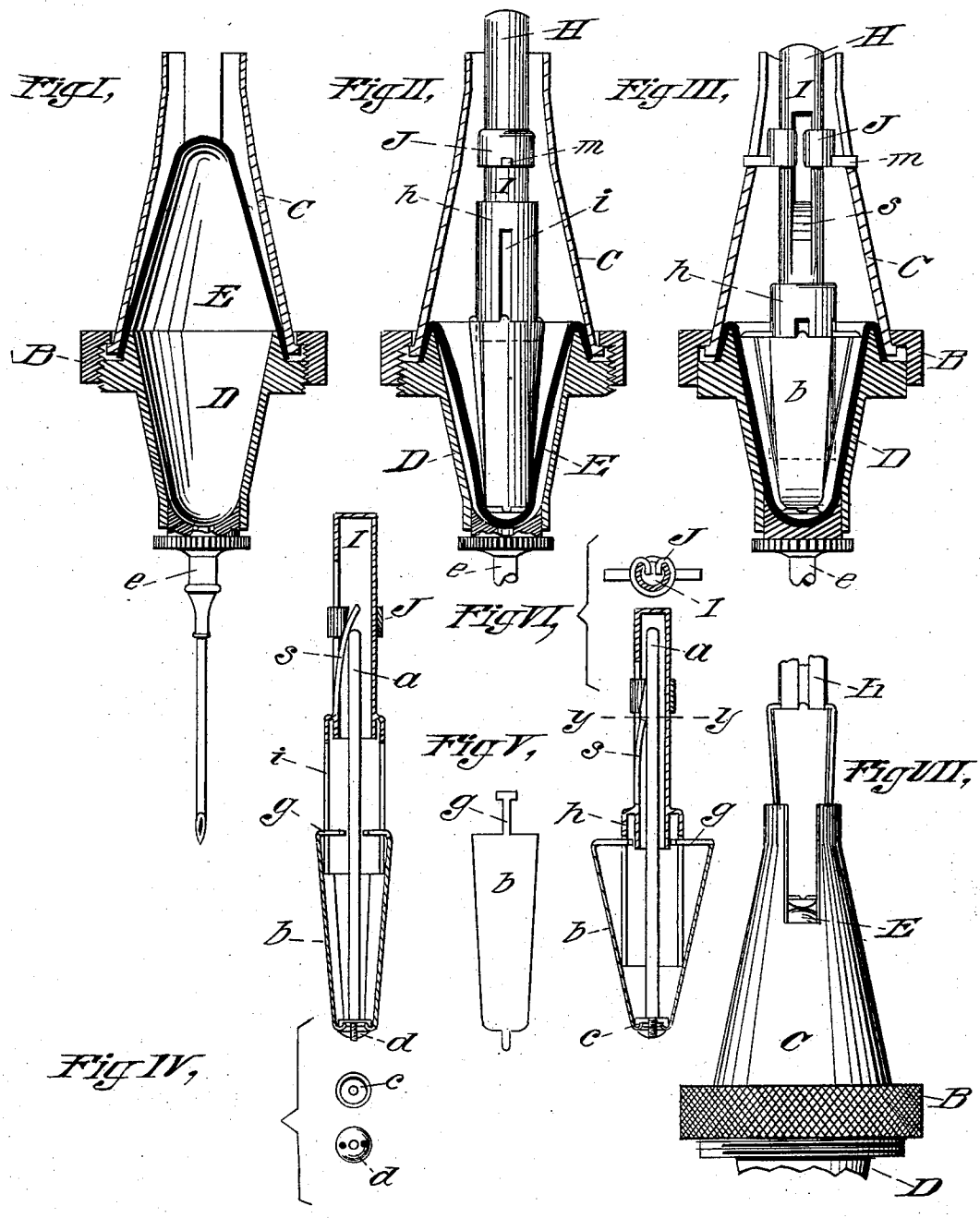
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C. M. BARTON.

HYPODERMIC SYRINGE.

(Application filed Feb. 28, 1901.)

(No Model.)



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CHESTER M. BARTON, OF HATFIELD, MASSACHUSETTS.

HYPODERMIC SYRINGE.

SPECIFICATION forming part of Letters Patent No. 687,367, dated November 26, 1901.

Application filed February 28, 1901. Serial No. 49,228. (No model.)

To all whom it may concern:

Be it known that I, CHESTER M. BARTON, a citizen of the United States, residing at Hatfield, in the county of Hampshire and State of Massachusetts, have invented a new and useful Hypodermic Syringe, of which the following is a specification.

My invention relates more particularly to improvements upon the syringe for which I obtained a patent April 10, 1888, No. 380,673, and in which a barrel with a nozzle had a flexible diaphragm extending across it and attached by its edges to the barrel with a plunger attached to the central part of the diaphragm to form with the diaphragm a piston within the barrel, the object of the present improvements being generally a more perfect emptying of the fluid-chamber, a longer life to the diaphragm, and facilities for packing and transporting the device in a more compact and convenient form than before; and the invention consists in the combination and construction as hereinafter described, and more particularly pointed out in the claims.

My invention is fully illustrated in the accompanying drawings, in which—

Figure I is a vertical central section of the barrel, ring, and diaphragm of my device with the plunger removed. Fig. II is the same with the diaphragm inverted by the plunger shown in elevation in one condition. Fig. III is the same with the diaphragm pressed against the barrel-wall by the plunger shown in elevation in an expanded condition and rotated a quarter-turn from the position shown in Fig. II. Fig. IV is a partial central section in elevation of the plunger as shown in Fig. II and also plan views of details of the end of the plunger. Fig. V is a plan view of a blank from which is formed an expanding-wing. Fig. VI is a partial central section in elevation of the plunger as shown in Fig. III rotated a quarter-turn, as seen in Figs. II and IV, and also a transverse section on the dotted line *y y* looking toward the end of the plunger-stem; and Fig. VII is a partial elevation of the outside of the syringe and a part of the plunger shown supported in the ring-top and resting upon the apex of the diaphragm.

Referring to the drawings, D is a conical barrel having its apex closed by the nozzle *e*, screwed into place.

E is a cone-shaped nipple, of rubber, with the edge forming its base joined to the base of the barrel.

C is a ring of a general conical form having its base extended over the bases of the nipple and barrel to inclose the base of the nipple between it and the barrel and form a close joint; and B is a screw coupling-ring engaging with the outside of barrel D and ring C and operating to bind the nipple to the barrel, so that no additional packing is needed to form a fluid-tight chamber of the space inclosed by the nipple and barrel.

As shown in Figs. I, II, and III, a cone-surface is formed upon the outside base of the barrel in reverse of the interior surface of the barrel and coinciding in pitch and diameter with the base of the rubber nipple, over which short cone the base of the nipple is brought, and over the base of the nipple the cone-base of the ring is drawn tightly by the coupling-ring B, threaded on a cylindrical part of the barrel below the short cone and having an interior shoulder to bear upon a corresponding shoulder upon the base of the ring B. It will be seen that the nipple in the position shown in Fig. I to form with the barrel the fluid-chamber and in the position it normally retains is perfectly at rest in having no folds or creases in it to weaken its walls, and this is an important advantage of this form of construction, the life of the nipple being thereby much extended. When for a brief interval the nipple is inverted upon itself, as shown in Figs. II and III, in order to empty the fluid-chamber it is restored to the position shown in Fig. I as soon as the syringe has been used by unscrewing the nozzle and inserting the plunger through the apex of the barrel, the plunger being left in the syringe until the device is to be used again and the nipple having thus had no time to be injured by its invertion. As shown more particularly in Fig. VII, the top of the ring is extended to form a support for the plunger resting upon the top of the nipple and in position to be operated by being pushed in by a finger of the hand grasping and directing the syringe, and with this object in

view the split top of the ring may be provided with a slight spring to cause it to hug the plunger.

My device may be regarded as composed of two parts—the fluid-chamber with its ring, nozzle, and coupling device, and a detached plunger adapted to invert and restore the nipple and to expand the nipple against the wall of the barrel to expel every particle of fluid from the syringe. The operation of the plunger H is to when started by a downward pressure from the position shown in Fig. VII of resting upon the top of the nipple E commence the invertion of the nipple and continue said invertion until the apex of the nipple rests upon the bottom of the fluid-chamber, as seen in Fig. II. At this time the larger part of the fluid in the chamber has been expelled, though the partial collapse of the unsupported nipple by its compression against the fluid in expelling it, as shown in Fig. II, leaves space for a portion of the fluid to still remain in the barrel. Without an interruption to the downward movement of the part of the plunger pressed by the finger the plunger is expanded to press the nipple against the wall of the barrel, as shown in Fig. III, to expel the last particle of fluid from the syringe. During the movement of the nipple in being inverted there is no friction between the rubber surfaces nor between the nipple and the barrel, as the interposition of the fluid serves as a lubricant.

The expanding-plunger H is constructed as follows: A rod *a* has hinged upon its lower end a plurality of wing-pieces *b*, inclosing it and extending up it a distance approximating the axial depth of the barrel, and being hinged to swing radially to the rod are of configuration to bring their edges together when closed against the rod to assume a cylindrical form nearly, as seen in Fig. II. A hinge is made for the wings upon the bottom of rod *a* by a channeled disk *c* over the end of the rod and resting against a shoulder thereof. Over the edge of the disk *c* curved hook ends of the wings are brought to rest in the channel, and over the screw end of the rod is run a nut *d* to confine the hook ends of the wings to the disk *c*, all as shown more particularly in Fig. IV, where although the drawing is greatly enlarged the disk and nut *d* are not large enough to have section-lines through them without interfering with the clearness of the drawing. The nut *d*, forming the terminal of the plunger H, together with the ends of the wings immediately above it, conform in contour when the wings are closed to the curved apex of the nipple E, as seen in Fig. II. The upper or free ends of the wings *b* fold against the edge of a cylinder *h*, arranged to slide axially on rod *a* and of a diameter larger than that of the closed wings at their hinge, so that as said cylinder is moved toward the lower end of the plunger the wings in contact with it will be swung out or expanded and the wings *b* are linked to the cylinder *h*, so as to be guided in their radial movement and held in proper relative position by arms *g* from their tops, which engage the cylinder and are held and guided by it as follows: The cylinder *h*, with its open lower end, has kerfs or slots *i*, opening through the edge of the cylinder and extending up in it radially, a slot for each wing, and the wings, with their arms *g* bent from the wings to be at approximately right angles to the axis of the cylinder *h*, are hooked to the cylinder, and while the longitudinal slots *i* permit the cylinder to slide up or down over the wing-arms *g* and permit the arms to move in or out radially the hooks shown on the ends of the arms *g* catch on each side of the slots *i* and prevent the wing ends from being absolutely free.

In Fig. V a wing is shown in the form of a blank punched out of a sheet of metal and only requiring a segmental form to be given it and the arm *g* and hinge-hook on the lower end to be bent to shape.

The top of cylinder *h* is shown closed, and into it is let concentrically a tube I. The tube I is made fast to the cylinder and with an open bottom to permit rod *a* to extend up into it has its upper end closed to present a convenient surface for receiving the pressure from the finger. From near where tube I joins the cylinder *h* two parallel upward-extended saw-kerfs through the wall of the tube form the sides of a slot near the top of the tube and below said slot the free sides of a tongue *s*, whose base is integral with the tube and so forms a hinge in effect, while its end is free to be depressed into the bore of the tube, as seen in Fig. III. The upper end of rod *a* is adjusted to come just below and in contact with the obstruction caused by the depressed tongue when the plunger is in condition to be first used to invert the nipple, as shown in Figs. II and IV, and the tongue *s* is depressed and held so by a ring J sliding upon the outside of the tube I and provided with ends extending down into the tube through the slot above and in prolongation of the tongue. It will be seen that the ring J can be slid over tube I to clutch the tube and rod *a* together, and in effect they are one structure when the plunger is pushed down to invert the nipple, as shown in Fig. II. The ring J is provided with, on opposite sides, lugs *m*, which together form a cross-head to cause the ring to be caught and held, when upon moving down with the plunger it comes against the proper stop at the proper time. The stop is provided for the ring J by a top surface of ring C, as seen more particularly in Fig. VII, and the relief of the rod *a* from the clutch, as determined by the stop, is timed to cause no break in the downward movement of the plunger needed to expel the last particle of fluid from the barrel.

Now, having described my invention, what I claim is—

1. A syringe consisting, essentially, of a

cone-barrel provided with a nozzle, a rubber cone-nipple extending across the barrel and attached to its edges, a ring connected to the barrel and drawn over the base of the nipple by a screw coupling-ring engaging it and a threaded part of the barrel and provided with an upward extension adapted to hold and guide a plunger in contact with the apex of the nipple, and a detached plunger adapted to rest upon the apex of the nipple within the barrel and ring and invert it upon a downward movement of the plunger.

2. The combination of a cone-barrel provided with a base having an outer cone-surface in reverse of its inner wall, a rubber cone-nipple having its edges drawn over the outer cone-surface of the barrel, a ring with an extension for seating and guiding a plunger in line with the apex of the nipple, and adapted to be drawn over the edges of the nipple to bind it to the barrel while preserving the cone shape of the nipple when forming a wall of the fluid-chamber, and a plunger adapted to invert the nipple in the barrel.

3. A conical barrel with nozzle, a cone rubber nipple, a ring uniting the two with an extension forming a guide and stop for a plunger, and an expanding detached plunger comprising a rod, a plurality of wing-pieces hinged at their ends to the bottom of the rod to expand radially upon said hinges, a cylinder inclosed by the wings with a flat end of larger diameter than that of the closed wings, and adapted to slide concentrically upon the rod to have its end expand the wings, a sleeve attached to said cylinder to inclose the rod and extend beyond its end to provide a pushing-handle, and a clutch uniting the sleeve and rod and released upon the downward movement of the plunger, by contact with the stop-surface upon the top of the ring, to permit the cylinder to commence the expansion of the wings, as and for the purpose set forth.

4. A syringe provided with an open top, conical barrel and rubber nipple adapted to be forced into and inverted in said barrel, and with a ring-top to said barrel supplying by its upper edge a stop-surface, and a plunger comprising a rod *a*, expanding wing-segments *b* hinged to the bottom of the rod, a cylinder *h* inclosing the rod and inclosed by the wing-segments *b* and linked to the free ends of the wings, a sleeve I inclosing rod *a* and attached at its lower end to cylinder *h*, a compressible tongue *s* formed in the wall of sleeve I, and adapted to be bent into the sleeve to obstruct its passage over rod *a;* and a ring with ends depressed into a slot in sleeve I, in prolongation of tongue *s*, adapted to slide over the tongue to depress it, and provided with a cross-head adapted to come in contact with the ring-top of the barrel, upon the downward movement of the plunger, to free the sleeve I, and so release the end of rod *a*, as and for the purpose set forth.

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