

(No Model.)

B. F. SUTTON.
SYRINGE.

No. 397,256.

Patented Feb. 5, 1889.

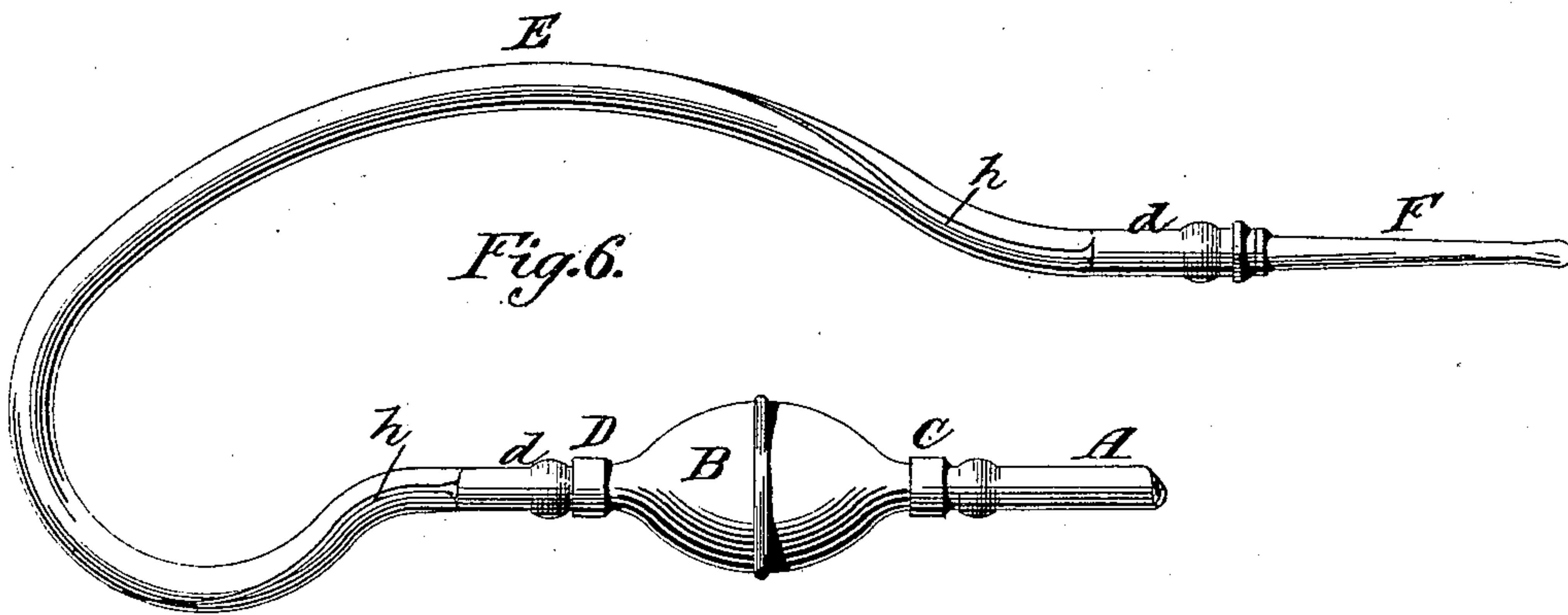
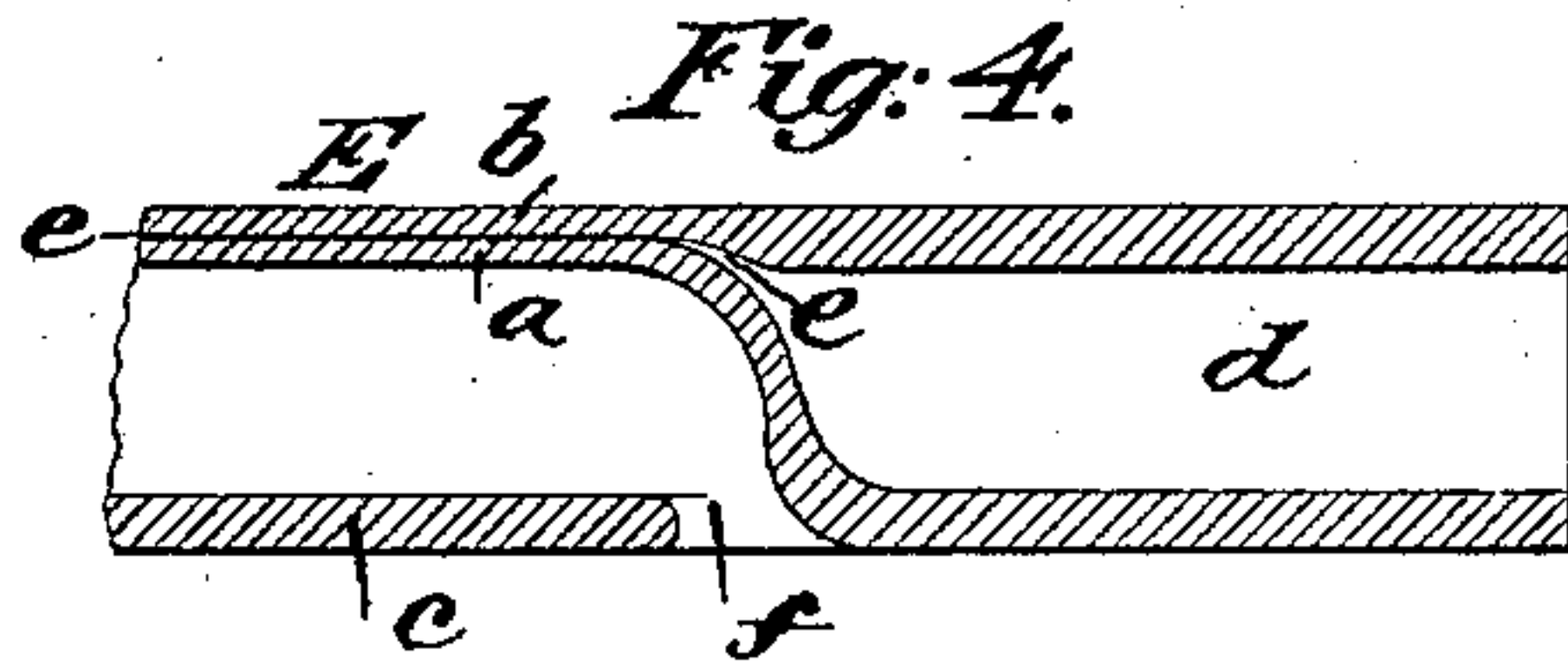
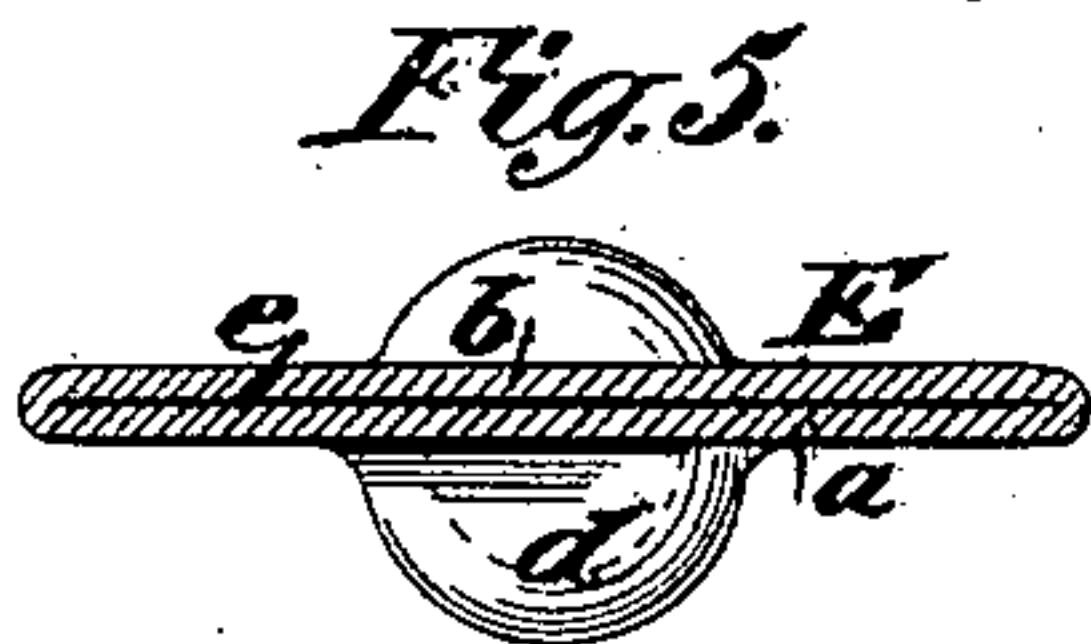
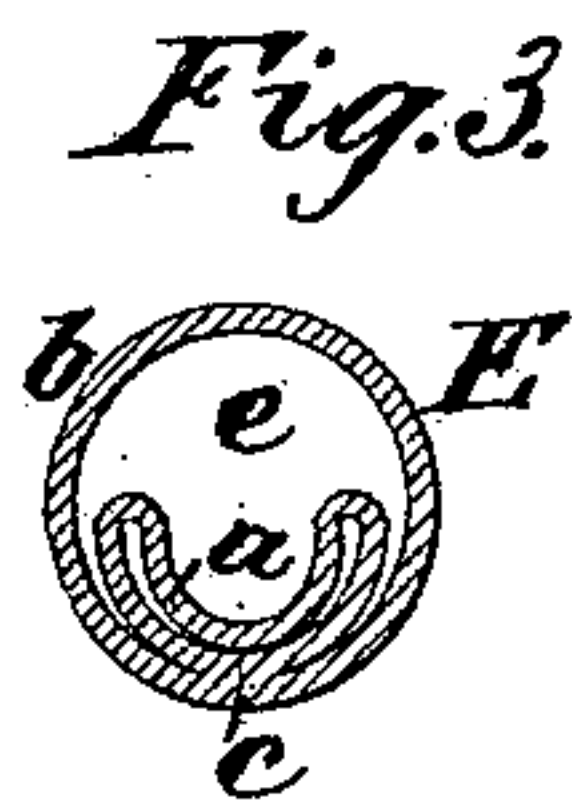
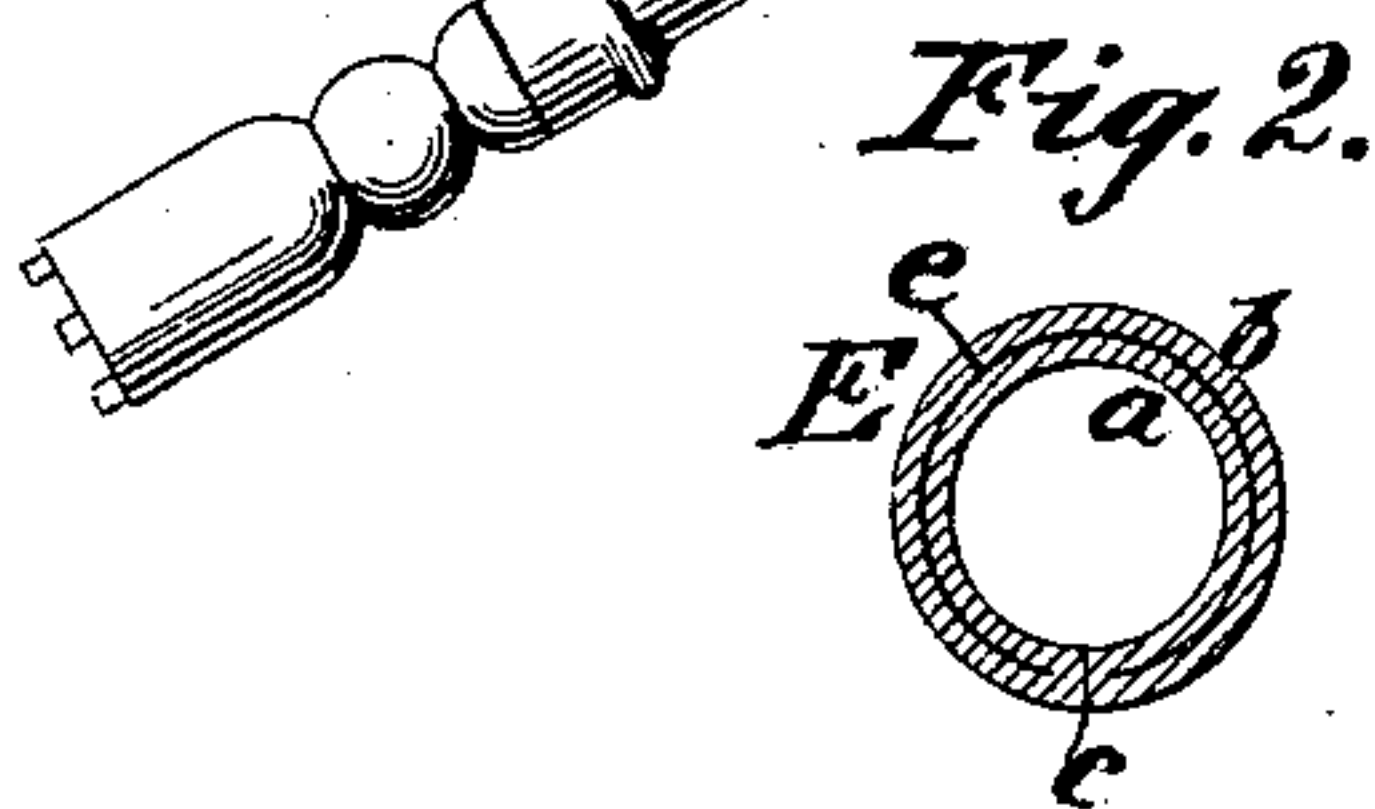
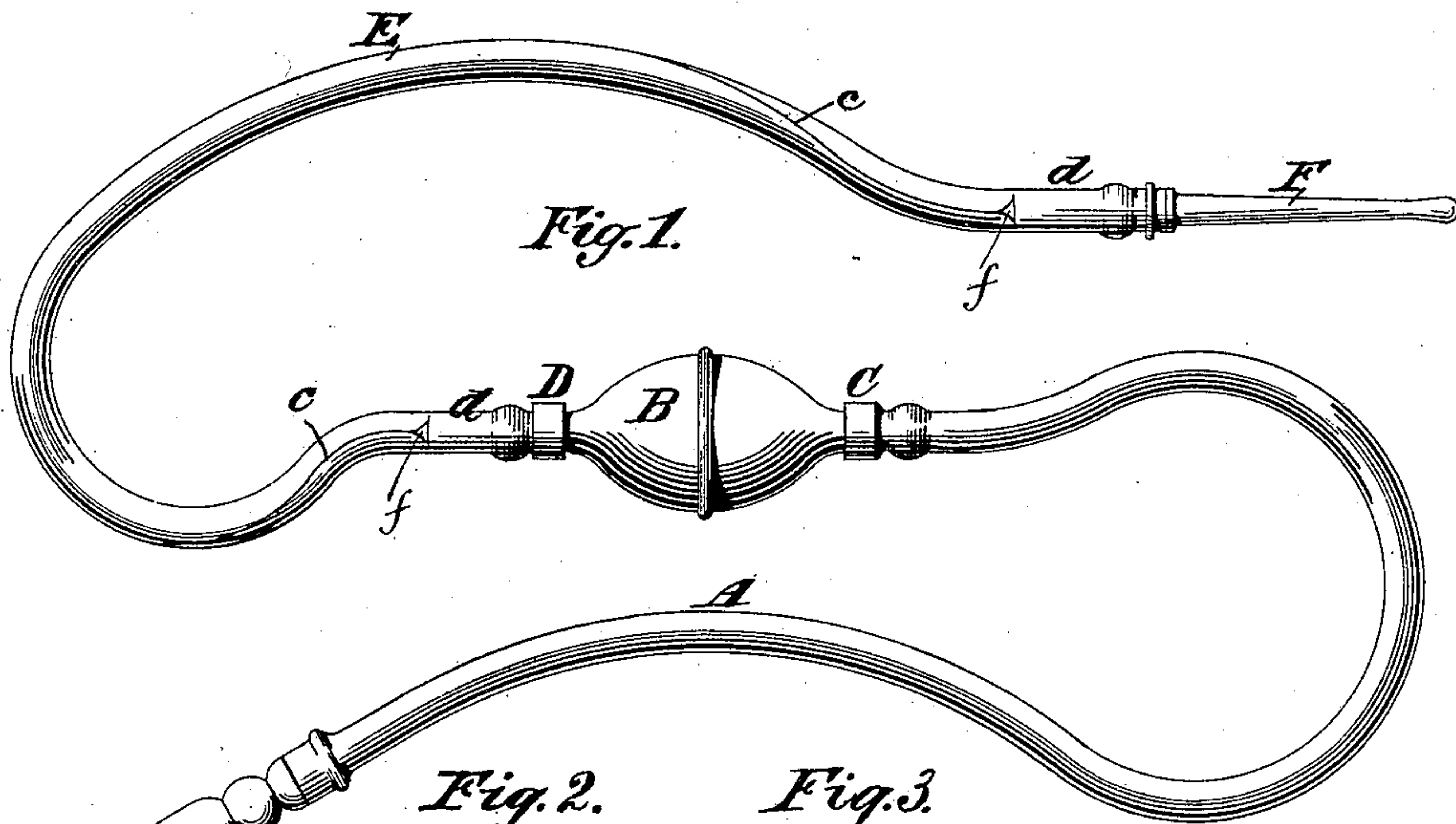


Fig. 7.

Witnesses.
Emil H. Carter.
O. Sundgren

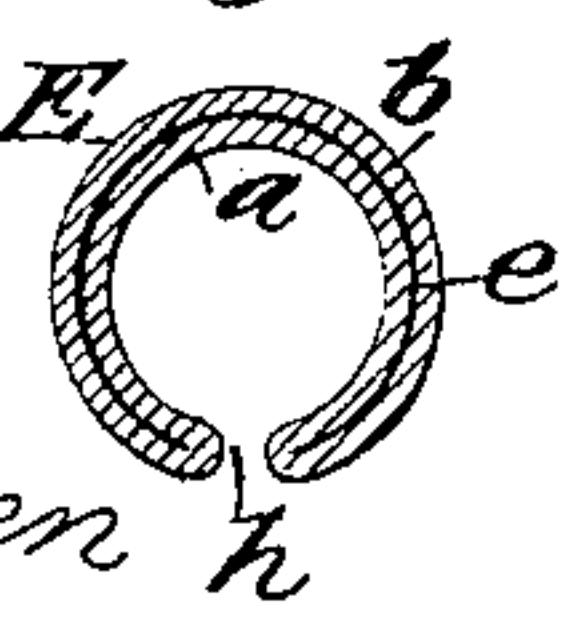
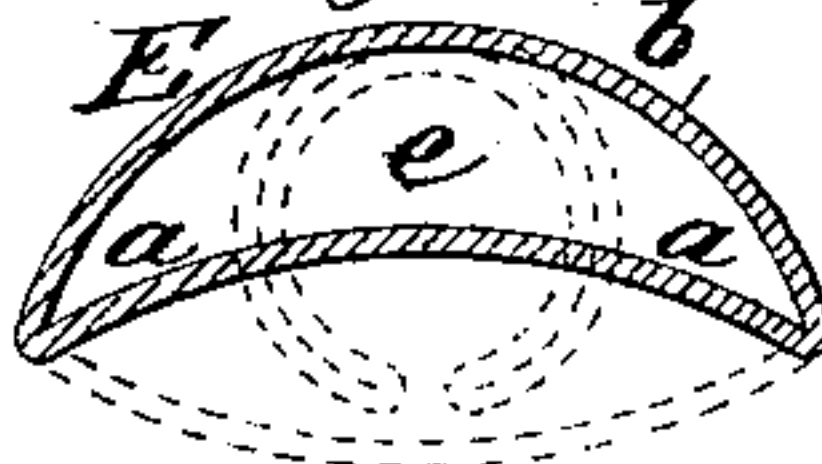


Fig. 8.



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UNITED STATES PATENT OFFICE.

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SYRINGE.

SPECIFICATION forming part of Letters Patent No. 397,256, dated February 5, 1889.

Application filed November 27, 1886. Serial No. 220,081. (No model.)

To all whom it may concern:

Be it known that I, BENJAMIN F. SUTTON, a citizen of the United States, and a resident of Brooklyn, in the county of Kings and State of New York, have invented a new and useful Improvement in Syringes, of which the following is a specification, reference being had to the accompanying drawings.

The principal feature of my invention consists in a conduit for a syringe comprising two tubes, one within the other, the inner one, or both of them, being flexible, the inner one containing an internal air-space and constituting an air-chamber, and the space between them being the conduit-passage, the principal object of such conduit and air-chamber being to provide between the discharge-valve and the outlet-orifice of the syringe for the dilation of the conduit-passage when pressure is applied to the syringe and the contraction of said passage when the pressure is relaxed, and thus to produce a continuous or non-intermittent flow of liquid from the syringe.

The invention also consists in certain novel combinations, hereinafter described and claimed, in which the said conduit forms an element.

In the accompanying drawings, Figure 1 represents a perspective view of a syringe containing my invention. Fig. 2 represents a transverse section of the conduit in its normal condition. Fig. 3 represents a transverse section showing the condition the conduit assumes when pressure is applied to the syringe. Fig. 4 is a longitudinal sectional view of one end of the discharge-conduit, showing the method of adapting it to the connections of the syringe. Fig. 5 is a transverse sectional diagram illustrating the method of making the conduit. Fig. 6 is a perspective view of a syringe, illustrating a modification of my invention; and Figs. 7 and 8 represent transverse sections of the discharge-conduit shown in Fig. 6.

Similar letters of reference designate corresponding parts in all the figures.

I will first describe my invention with reference to Figs. 1, 2, 3, 4, and 5, which represent a bulb-syringe, having its suction-tube A, bulb B, and the induction and eduction valves at C and D all of usual construction.

E designates the discharge-conduit, which constitutes my invention. This conduit for nearly the whole of its length consists of two tubes, *a* and *b*, situated one within the other and united along one side, as shown at *c* in Figs. 2, 3, and 4, the space *e* between the two forming the conduit-passage, which in Figs. 2 and 4 is shown closed up, as in the normal condition of the conduit when there is no pressure applied externally to the bulb B, but which in Fig. 3 is shown dilated, as when pressure is applied to the liquid within it by the compression of the bulb. At each or either end of this conduit is a socket, *d*, which communicates with the space *e* between the tubes, as shown in Fig. 4, but is closed to the interior of the inner tube, *a*, which communicates with the atmosphere through an opening, *f*, as shown in that figure, and thus constitutes an air-chamber. The socket *d* forms a continuation of the conduit-passage *e*, and also enables the conduit E to be attached by the couplings commonly employed to the bulb B and the nozzle F. The discharge-conduit thus constituted might be constructed in various ways; but the method which I have adopted and have represented is to make the whole integral, for which purpose I first make a tube of soft and plastic india-rubber, prepared for vulcanization, of about twice the intended caliber of the center tube, *b*, but contracted at each end of a size to form the sockets *d d*. I then fold the said tube all the way between the sockets to a substantially flat form, when it, the tube, and socket present the form substantially as shown in Fig. 5, and I finally bring the folded edges together, as shown at *c* in Fig. 1, and cement them together along their whole length, except that for a certain distance at each of the folds I leave the edges separated to form an opening, as shown at *f* in Figs. 1 and 4, for the free ingress and egress of air to and from the inner one, *a*, of the two tubes *a b* which have been thus formed, the inner tube, *a*, which constitutes an air-chamber within the discharge-conduit, being closed to the socket *d*, and the space *e* between the two tubes being in communication with the said sockets.

The whole of the conduit structure being vulcanized in the form just described, the

normal condition of the bitubular portion of the conduit is as shown in Figs. 2 and 4, the space between them being contracted to a minimum, and this condition is preserved by the natural elasticity of the rubber until pressure is applied to the bulb and pressure thereby produced within the conduit. Every time pressure is applied to the bulb the pressure thereby produced in the conduit-passage *e* produces the collapse of the tube *a* or air-chamber and the dilation of the conduit-passage, as shown in Fig. 3, and during the intervening intervals, when the pressure on the bulb is removed or relaxed, the natural tendency of the tube *a* or air-chamber to expand produces the contraction of the passage *e*, so that the expulsion of the liquid from the said passage continues while the bulb is expanding as well as while it is being compressed, and the operation of the syringe may be made continuous.

It is obvious that the junction at *c* of the edges of the large folded tube of which the two tubes *a* and *b* are formed need not extend through the whole length of the bitubular portion of the conduit, but that the juncture might be omitted, as shown at *h* in Figs. 6 and 7, for any portion of the length, or, indeed, for the whole length. In such case pressure

applied to the bulb and transmitted to the liquid in the conduit-passage would tend to make the two tubes, or the portions thereof left open at *h*, assume the form shown in bold outlines, Fig. 8, or in case of still greater pressure the form shown in the same figure by the larger dotted diagram.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. A conduit for a syringe, comprising two flexible tubes, one within the other, the space between the two being the conduit-passage, substantially as and for the purpose herein described.

2. A syringe having in its discharge-conduit a flexible air-chamber contracting under pressure and expanding on cessation of pressure applied in working the syringe, substantially as and for the purpose herein set forth.

3. The combination, with the discharge-conduit of a syringe, of a flexible tube or chamber arranged within said conduit and communicating with the outer air, substantially as and for the purpose herein described.

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Witnesses:

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