

W. PAINTER.  
FLEXIBLE PUMP-VALVE.

Patented Aug. 29, 1876.

No. 181,535.

Fig. 1.

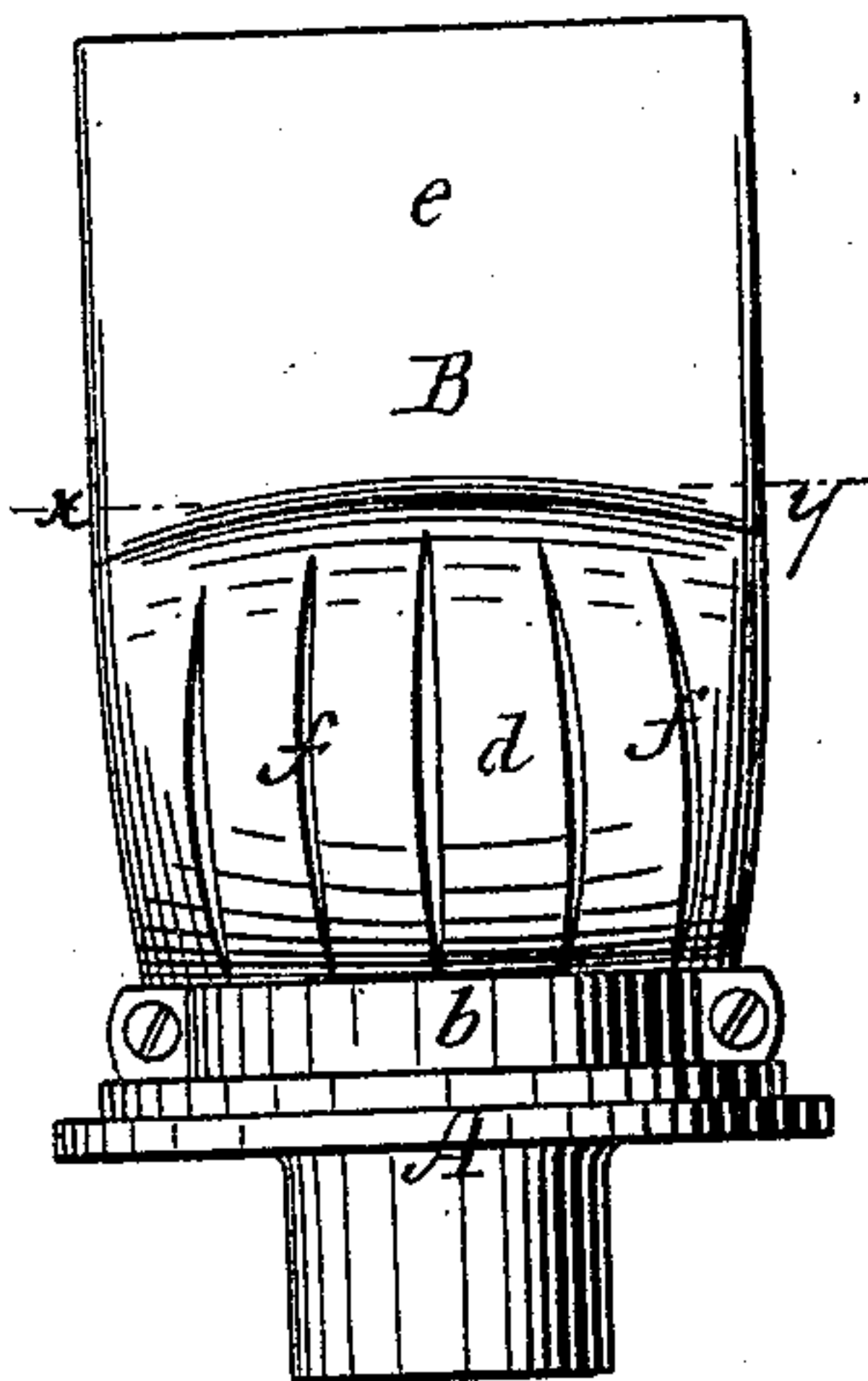


Fig. 2.

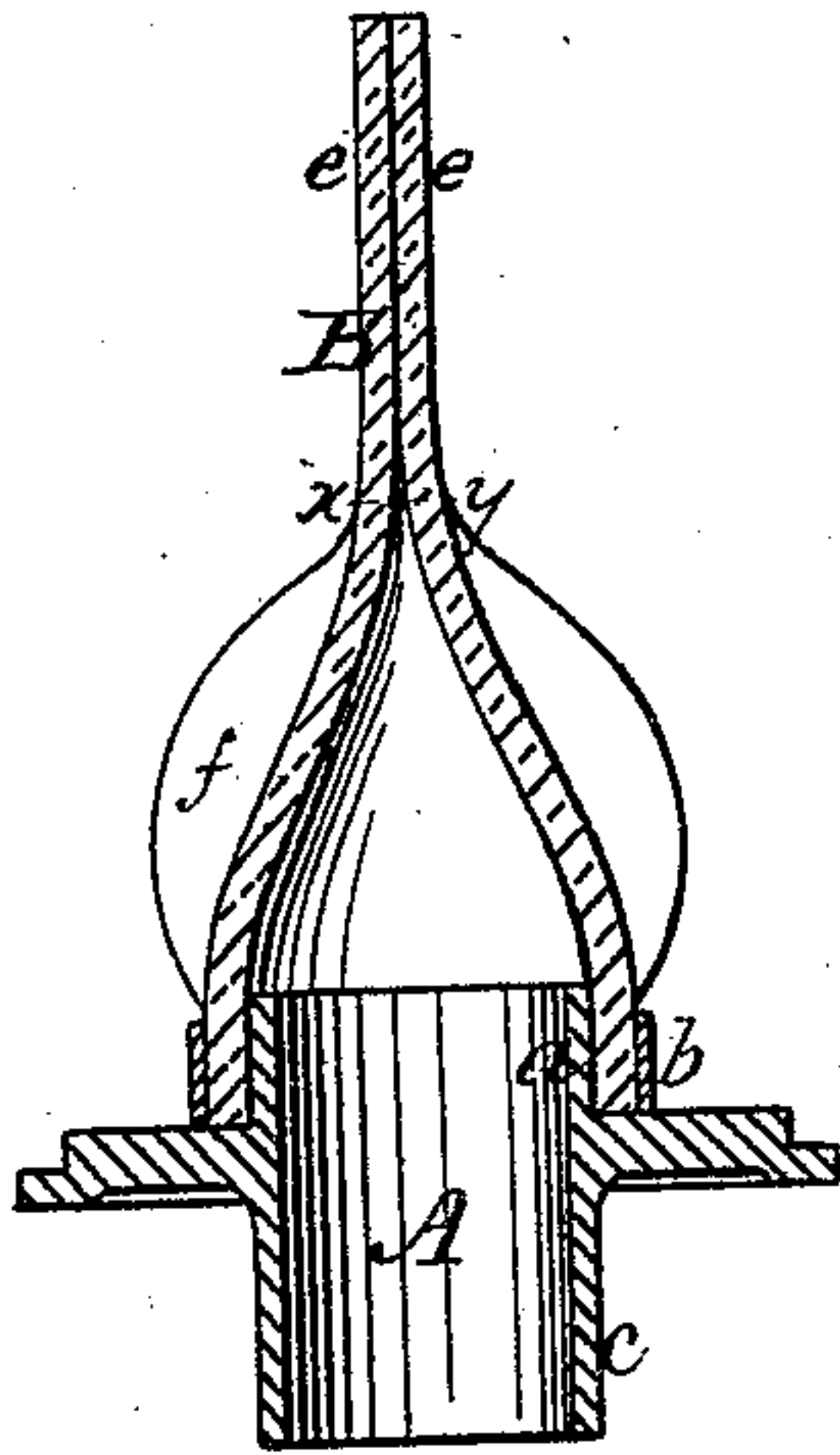


Fig. 3.

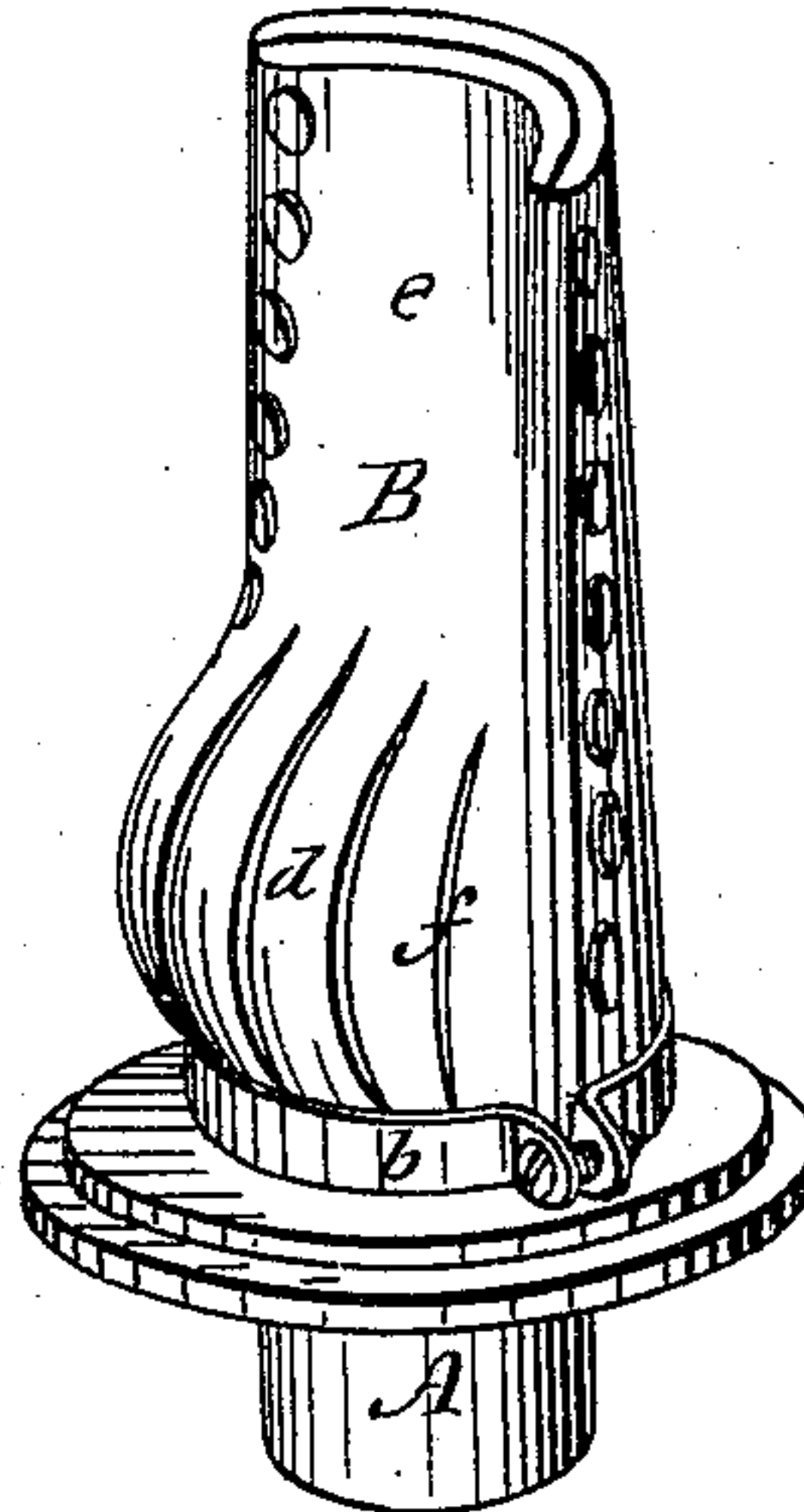


Fig. 4.

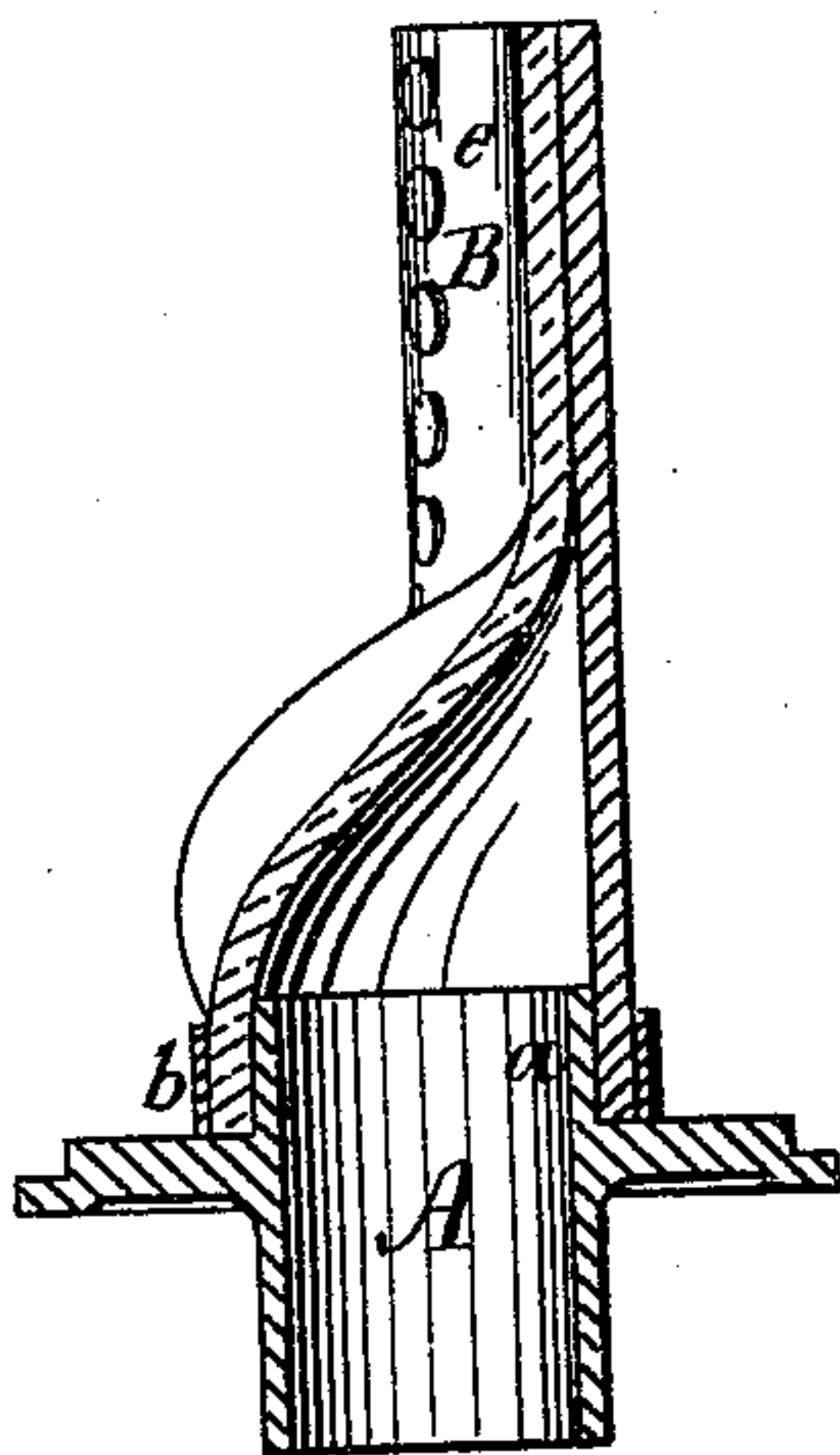


Fig. 5.

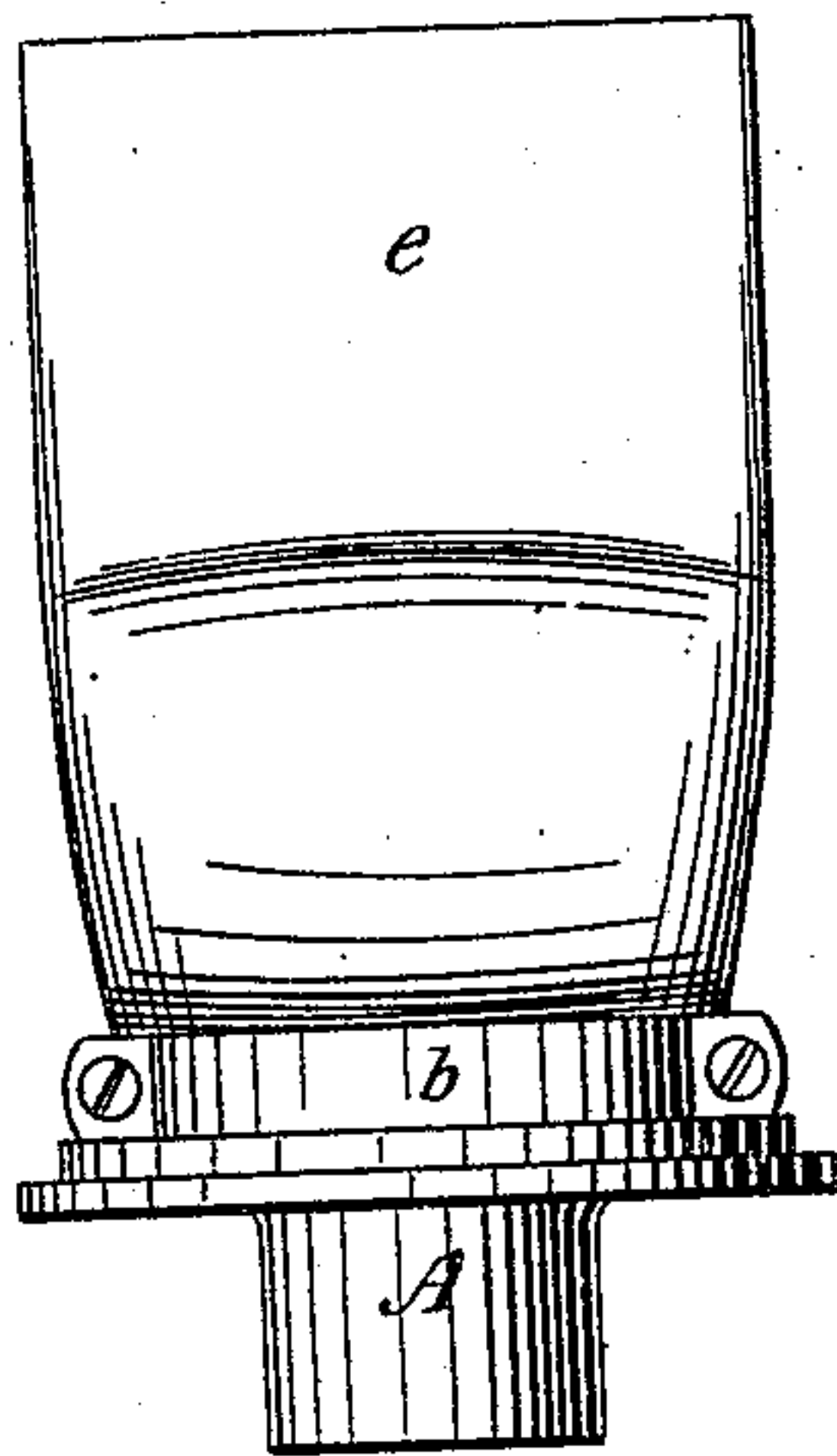
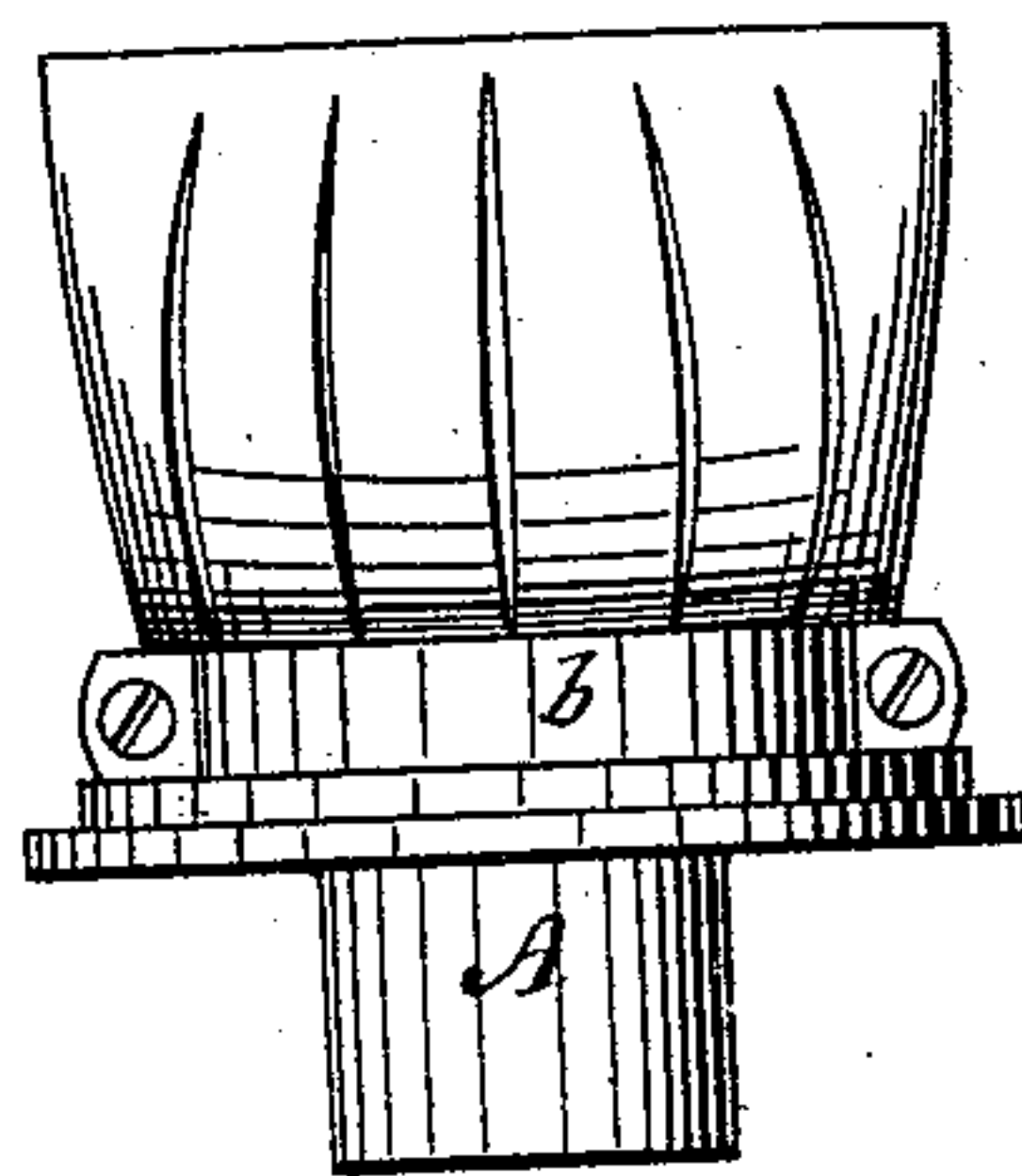


Fig. 6.



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# UNITED STATES PATENT OFFICE.

WILLIAM PAINTER, OF BALTIMORE, MARYLAND.

## IMPROVEMENT IN FLEXIBLE PUMP-VALVES.

Specification forming part of Letters Patent No. **181,535**, dated August 29, 1876; application filed August 1, 1876.

*To all whom it may concern:*

Be it known that I, WILLIAM PAINTER, of the city and county of Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Flexible Valves; and I do hereby declare that the following specification, taken in connection with the drawings furnished and forming a part thereof, is a clear, true, and complete description of the same.

My invention relates, mainly, to that class of flexible flap-valves which are described in my Letters Patent dated August 5, 1873, and also in numerous other Letters Patent granted to me since that date. These valves are especially intended for use in connection with apparatus for excavating night-soil from privy-vaults, and the contents of cess-pools, &c. Such a valve in most cases involves a feature in its construction at the base which will effectually prevent introversion, and also another feature which, when the valve should be closed, will enable the flaps of the valve to close down upon and around any solid obstructive matter which may be temporarily retained in the valve. As heretofore constructed by me these valves have been provided at their bases with metallic braces or stiffeners which prevent introversion, while the long flaps of the valve are freely flexible in all directions. The valve subject of this application is rendered incapable of introversion without the use of metal, and although metallic protecting-plates will in practice be used at the interior of the valve at its base or entrance, said plates need not be at all relied upon for performing the function of braces or stiffeners for preventing introversion.

My invention consists, first, in a flap-valve having a base composed of a heavy mass of vulcanized rubber, sufficiently rigid to prevent introversion, and one or two coincident flaps arranged to engage with each other, or with a coincident surface of corresponding area; second, in a flexible valve with or without a flap or flaps, having a heavy base of flexible material, which is at intervals scored or slitted longitudinally, whereby the base of the valve is prevented from being introverted, is easily opened, and is provided with a desirable de-

gree of lateral flexibility, without increasing its flexibility longitudinally.

To more particularly describe my invention, I will refer to the accompanying drawings, in which—

Figure 1 represents, in side view, a valve with two flaps embodying my invention. Fig. 2 represents the same in central longitudinal section. Fig. 3 represents, in perspective, a valve with one flap embodying my invention. Fig. 4 represents the single flap-valve in longitudinal central section. Figs. 5 and 6 represent, in side view, two valves, embodying in each case but one of the stated features of my invention.

In each of the figures, A denotes the valve-plate, which may be adapted for use as a piston, or it may be arranged for use as the stationary valve-plate in a pump-barrel or other chamber, when intended to prevent the reflux of fluid and other matter which has been passed through the valve. As heretofore, the valve-plate is provided with a flange at *a*, for connection with the flexible portion of the valve, which is secured thereto by the clamp-band *b* with bolts, as heretofore. The neck *c* is provided for connection with suction-hose, as heretofore, on all stationary flap-valves of this general class made by me. B denotes the flap-valve proper. The base *d* is preferably made of elastic vulcanized rubber, which will sometimes be combined with textile material, in a manner well known. The flaps *e*, of which there are two in valves Figs. 1 and 5, are united at their edges, and flatly engage with each other, substantially as shown in my Letters Patent of August 5, 1873.

It will be seen that the base of the valve is made very heavy, and in a full-sized valve is, say, from one and a half to three inches in thickness, is tapered, and is comparatively thin at the line marked *x y*. If the flaps *e* were cut off at their junction with the base at *x*, and the base were constructed as is shown in Fig. 5, the valve would then be in all essential particulars the well-known Perreux valve, patented in England, A. D. 1856, and numbered in the annual series 1,076. This Perreux valve has the vulcanized rubber so disposed and proportioned that it has



sufficient rigidity to prevent introversion. It is obvious, however, that in proportion as the rubber is massed so as to secure the requisite capacity of preventing introversion, it is rendered more difficult to be opened for the passage of solid matters of such a size as could readily pass through the opening in the valve-plate, and also that the valve has but little capacity to close around and upon any solid matters which may be temporarily retained in the valve at a time when it should be practically closed in service. This latter point will be clearly obvious when it is considered that when the rubber is massed to secure longitudinal rigidity, the valve must of necessity be equally rigid laterally. It is to correct this lack of lateral flexibility in the Perreaux valve that one feature of my present invention is especially intended. This feature is embodied in the longitudinal slits or cuts shown at *f* in several of the figures. These slits may be cut with a knife, or formed in the rubber by means of thin plates adjusted in such molds as I preferably employ for making these and similar valves. The depth of these slots is greatest at a point midway between their upper and lower ends, and it is gradually lessened in both directions. At no point should the slits or scores be of a depth greater than, say, two-thirds of the thickness of the rubber. It is, however, difficult to prescribe any definite depth of slot or thickness of the rubber, as these may be profitably varied in accordance with the size of the valves and the nature of the particular service for which the valves are intended.

It is to be distinctly understood that I do not limit that portion of my invention which consists in providing the base of the valve with the longitudinal slits extending partially through the flexible material to a flap-valve, for I am well aware that the Perreaux valve may be improved to a valuable degree by providing it with said slits, as shown in Fig. 6, as it is thereby rendered more flexible laterally without detracting materially from its capacity to resist back pressure and prevent introversion.

The flap-valve shown in Figs. 1 and 2 has

two flaps, and the base is slitted longitudinally. In Figs. 3 and 4 a valve is shown having but one flap, which engages with a concave valve-seat. Its base is, however, like that on one side of the valve shown in Fig. 1, and is slitted in like manner. The valve, Fig. 5, is like the one shown in Fig. 1, with the exception that it is not slitted at the base, and I desire it to be distinctly understood that I do not limit my present invention to a flap-valve with a heavy base which is slitted, for I am well aware that the Perreaux valve, when provided with the flaps *e*, as in Fig. 5, has great practical value in night-soil apparatus, although not so efficient in its operation as is the case when provided with the slits *f*.

The prime objection to the Perreaux valve consists in its lack of flexibility both longitudinally and laterally; but when provided with the flaps *e*, these latter secure a closure of the valve upon solid matter held therein, regardless of the inability of the thick base of the valve to close upon and around said matter. As in all valves of this general class heretofore made by me, the valves herein shown are provided at their entrance with protecting-plates, which serve solely to guard the surfaces of the valves at their bases against injury from undue abrasion, and cuts from the sharp or ragged edges of solid matters liable to be encountered in night-soil operations.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. A flexible valve provided with a flap or flaps and a heavy base, which is composed of flexible material, but which is sufficiently inflexible longitudinally to prevent introversion, substantially as described.

2. A flexible valve, with or without the flap or flaps *e*, sufficiently inflexible longitudinally at its base to prevent introversion, and scored or slitted longitudinally to provide for lateral flexibility, substantially as described.

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