

W. W. STEWART.

FOUNTAIN PEN.

No. 378,987.

Patented Mar. 6, 1888.

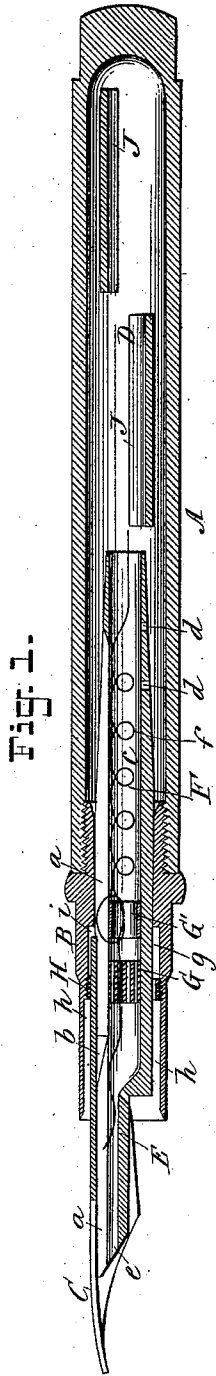


Fig. 2.

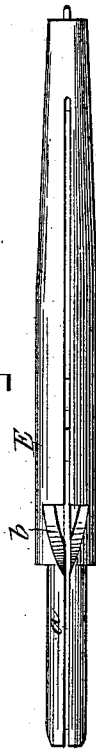


Fig. 3.



Fig. 7.



Fig. 8.



Fig. 9.

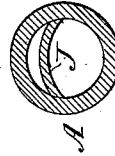


Fig. 4.

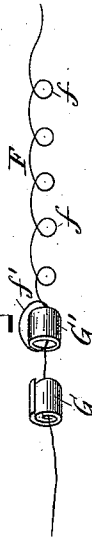


Fig. 6.

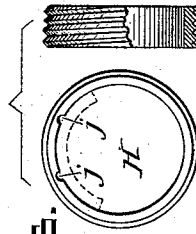


Fig. 5.



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FIG. 10.

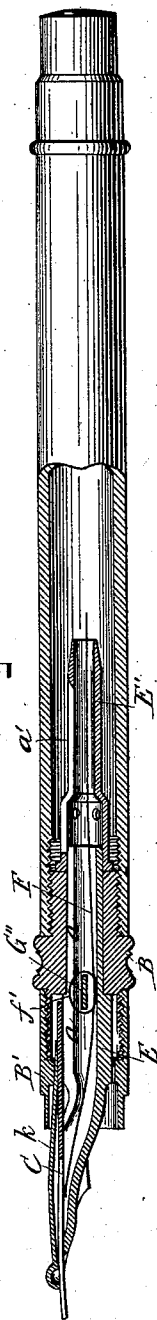


FIG. 11.

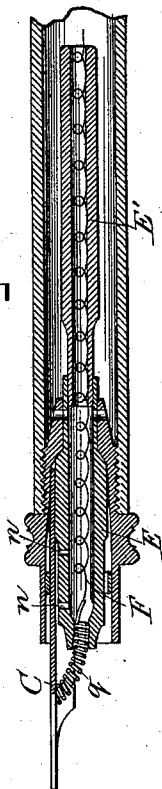


FIG. 14.

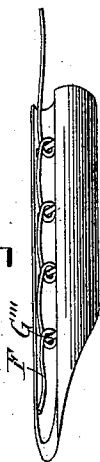


FIG. 16.

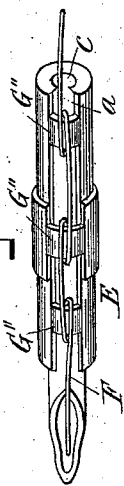


FIG. 15.

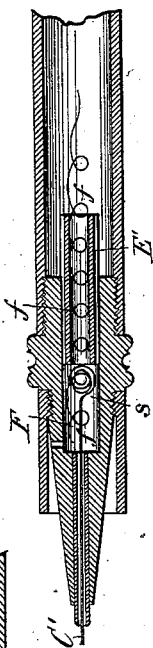


FIG. 17.

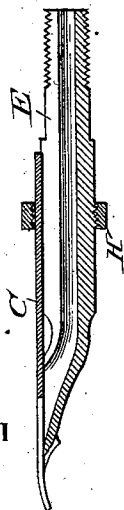


FIG. 12.

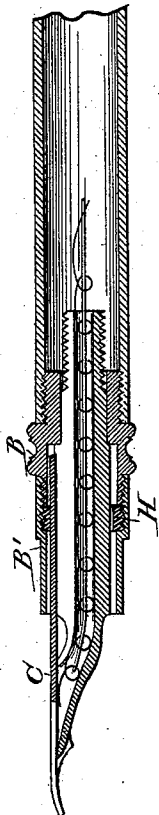
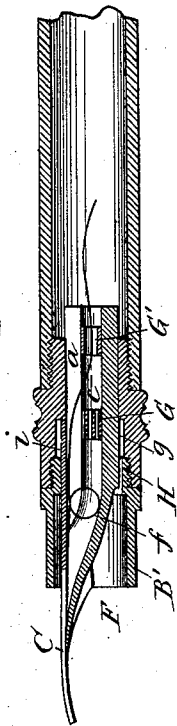


FIG. 13.



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UNITED STATES PATENT OFFICE.

WILLIAM W. STEWART, OF BROOKLYN, NEW YORK.

FOUNTAIN-PEN.

SPECIFICATION forming part of Letters Patent No. 378,987, dated March 6, 1888.

Application filed April 27, 1887. Serial No. 236,272. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM W. STEWART, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Fountain-Pens, of which the following is a specification.

This invention relates to fountain pen holders of that class having a hermetically-closed ink-reservoir in the handle communicating with the pen through a duct or passage.

The object of my invention is to afford improved means for controlling the flow of ink to the pen and the entrance of air to the holder in order to control the action of the air-bubbles and prevent their sealing or choking the duct. To this end I arrange in the air-duct what I term an "irritant," of polished metal or other non-absorbent material, which is looped at intervals in order to form partial pockets for catching the air-bubbles and confining them until they grow so large as to escape therefrom, whereupon they are subdivided by the irritant, which maintains an uninterrupted line of liquid throughout the length of the duct. I also place in the air-duct one or more capillary partitions which serve to subdivide the ink and air without materially obstructing the flow. These partitions may consist of spiral rolls or scrolls, tubes, flat plates, or transverse pins, and may be made of any suitable material, as quill, hard rubber, or metal. I also loop the irritant through or around one or more of the partitions. By preference I form the ink-duct of a tubular bar or plug inserted in the nozzle of the holder and removable therefrom, and provided with a capillary slit along its upper side extending from the pen up into the reservoir.

My invention also aims to improve the means for holding or confining the pen in the nozzle of the holder, in order to facilitate its insertion, removal, and adjustment. To this end I provide a ring or band, preferably of hard rubber or metal, which slips over the removable plug or feed-bar and the pen, and which, when the pen is adjusted to the proper position on the bar, confines it tightly in place thereon and holds it thereto while the bar is being inserted in the nozzle.

The accompanying drawings show several

different constructions of pens embodying my invention.

Figure 1 is a longitudinal mid-section of the preferred construction of holder. Fig. 2 is a plan view of the feed-bar or plug thereof removed. Fig. 3 is a longitudinal section of the feed-bar. Fig. 4 shows the irritant and capillary partitions removed. Fig. 5 is a transverse section cut on the line 5 5 in Fig. 1. Fig. 6 shows the pen-fastening ring removed, in two views drawn on double the scale of the preceding figures. Fig. 7 is a perspective view of the scroll-like capillary partition, and Fig. 8 is a similar view of the tubular capillary partition around which the irritant is looped. Fig. 9 is a transverse section of the holder on the line 9 9 in Fig. 1. The remaining views illustrate modified constructions. Figs. 10, 11, 12, and 13 are longitudinal mid-sections each of a different construction of holder. Fig. 14 is a perspective view of a feed-bar embodying part of my invention. Fig. 15 is a plan of another construction of feed-bar modified according to my invention. Fig. 16 is a longitudinal mid-section of a stylographic pen embodying part of my present invention. Fig. 17 is a longitudinal section of the feed-bar and pen removed, illustrating a modification of the ring which binds the pen to the feed-bar.

I will first describe the construction shown in Figs. 1 to 8.

Let A designate the holder; B, the tubular nozzle at the lower end thereof; C, the pen or pen-nib; D, the reservoir or ink-hollow in the holder, and E the feed bar or plug. These parts are, in general, of the usual construction.

The feed-bar E fits tightly within the throat or bore of the nozzle B and its upper end enters within the holder. Along its upper side, and extending from within the holder near its upper end downwardly to or nearly to its lower end, is formed a capillary slit, *a*, which constitutes a duct or capillary conduit down which the ink may flow to the pen. I prefer to form in the upper side of the feed-bar where it comes against the under side of the pen an angular notch or recess, *b*. This constitutes the "capillary grip" in my Patent No. 314,547, of March 24, 1885, its purpose being to hold a quantity of ink against the pen in readiness to be drawn upon for shading or heavy strokes

where a sudden and considerable flow of ink is required.

The feed-bar is hollow or tubular, its bore *c*, which extends from its upper end down to a point underneath the pen, constituting the duct for ink or air. This duct communicates with the ink-reservoir either through the upper end of the bar, if that end be open, as shown, or through the capillary slit *a* or small perforations *d d*. These latter may be used or not, as desired. If the upper end of the feed-bar be left open, they may be omitted. In any case it is only essential that the bore *c* should have some communication more or less free with the ink-reservoir. The lower end of the duct *c* communicates with the under side of the pen *C* through the medium of the capillary slit *a* and the notch or grip *b*, (either or both.) The lower end of the feed-bar is preferably contracted, and is formed with a minute bore, *e*, extending through it to its lower end.

It is what I term an "irritant," which I place in the bore or duct in the feed-bar. My Patent No. 314,547, hereinbefore referred to, describes an irritant arranged in a capillary slit formed in the top of the feed-bar corresponding to the slit *a*, being for the purpose of keeping it open and free from clogging by the formation of a solid deposit from the ink. I now arrange the irritant in the duct itself more in accordance with my Patent No. 222,959, of December 23, 1879, which illustrates a fine metallic wire extended through the ink-duct for the purpose of facilitating the upward movement of the little bubbles of air entering the duct near the pen.

The irritant, *F*, may consist of any slender, somewhat flexible, and glazed, polished, or non-absorbent material. I prefer the use of a fine-polished gold wire, although I find that bristles, horse-hair, and other analogous substances answer the purpose well. I carry the irritant through the duct *c*, forming in it one or more loops, *ff*, which fill or nearly fill, by preference, the duct. The lower end of the irritant should extend down into or through the bore *e*, being thus brought into close proximity to the pen, or it may extend into the slit *a* and impinge directly upon the pen, so as to be agitated by the movement thereof in writing. The upper end of the irritant may terminate in the duct *c* or may extend beyond into the ink-reservoir.

The polished or glazed surface of the irritant attracts to it the liquid component of the ink, and thus maintains what I term a "liquid-line," which, according to my present invention, is looped back upon itself at intervals. This liquid-line acts to moisten or lubricate the air-bubbles as they pass up the duct. The air enters beneath the pen through the slit *a* or small bore *e*, and passes into the duct *c* in the form of minute bubbles or froth, which, collecting in the lower portion of the duct, resolves itself into larger bubbles, which are slowly drawn upward into the holder by the

suction therein, occasioned by the outflow of ink to the pen. The ascending bubbles are caught by the loops *ff* in the irritant, and their too rapid rise into the reservoir is thus prevented. The openings in the loops and the spaces between the loops become filled with bubbles, which, by attracting smaller bubbles to them, tend continually to expand. If this tendency were not resisted, large bubbles would be formed, which would occupy the entire area of the duct and would expand against the walls thereof, and, being inclosed in tenacious films, would offer serious obstruction to the downward flow of fluid. This result is prevented by the looping of the irritant, since the bubbles are imprisoned in the loops and intervening spaces, and when they expand beyond the area of the loops or spaces they subdivide themselves against the irritant, which acts to cut or shear them either into two smaller bubbles or to cut off a portion of the air, which, forming a smaller bubble, passes up along the irritant to the next loop or space above, where it may coalesce with another bubble, and thereby cause a repetition of the same action. Thus by its own movement, due to the suction in the holder, the air is perfectly controlled in its ascent and is kept sufficiently subdivided to prevent its acting as a plug or stopper to close the duct, and at the same time the ascending air is utilized to obstruct, to some extent the downflow of ink through the duct, in order that such flow may not be too great in volume or too rapid. The ink passes down chiefly along the inner wall of the duct, which, being made preferably of hard rubber, becomes soaked with the ink, and consequently affords a surface well adapted to attract and promote the flow of liquid. The ink also flows down through the capillary slit *a*, which affords a continuously-open channel not liable to be obstructed by bubbles.

The motion of the pen in use will to some extent vibrate or agitate the irritant, since the latter is, or should be, arranged very freely within the duct, and should be of very elastic or flexible material. This vibration facilitates the upward movement of the bubbles of air, while at the same time it favors the coalescing of adjoining bubbles, so that, while a continuous action is maintained, there is no tendency to bring down the ink too freely, so that it shall roll out of the pen in drops, as is the case with defective holders. In this pen a most perfect balance of opposing forces is maintained, resulting in a flow of ink which adapts itself with the utmost nicety to the demands made upon it in the use of the pen.

The "looped irritant" provided by my present invention is not to be confounded with a spiral coil of wire inserted within the ink-chamber, as shown in Fig. 5 of my Patent No. 253,953, since with such a coil there is no successive cutting of the bubbles as they ascend, nor any means of preventing them from filling and plugging up the ink-duct. In my looped irritant the loops stand approximately in a

longitudinal plane, whereas in a spiral coil they stand approximately in a transverse plane. Nor should an irritant be confounded with a wire which is covered with thread or other absorbent fabric, as it is essential to the proper action of an irritant that it should have a glazed or polished and impermeable surface, its function being the opposite of that of an absorbent substance, such as wicking or permeable threads.

I further obstruct the duct by the insertion in it of one or more capillary partitions, two of which are shown in Fig. 1, (lettered, respectively, G and G'.) The capillary partition G, which is shown detached in Fig. 7, consists of a spiral roll of quill, by preference, or of thin polished sheet metal or of thin polished hard rubber. The convolutions of this roll or scroll are slightly out of contact, leaving a continuous capillary space between them. The irritant passes, preferably, through the center of the roll. The roll or scroll becomes saturated with liquid, or, if of impermeable material, it attracts the liquid to it, and the air in ascending through its capillary interstices is necessarily subdivided into fine froth. The thorough moistening or saturation of the air is thus insured—a condition which is practically advantageous, since it tends to prevent the after formation of the air into tough coherent bubbles or sacs.

The capillary partition G', which may be arranged either above or below the partition G, consists simply of a short cylindrical tube of quill, hard rubber, polished metal, or other material, which is fitted firmly within the bore *c*. The irritant is coiled or looped around one side of this partition or tube, as shown at *f'*. The outer portion of this loop may enter the slit *a* or not. The doubled irritant thus passes through the center of the tube G', so contracting the opening or passage through it that it becomes, when filled with the minute bubbles of air, in effect a capillary passage. The tube G' serves to facilitate the coalescing of the minute bubbles or froth into larger bubbles, which are thence started on their upward course along the irritant. It also serves as a partition to cut off the capillary slit *a* from the bore or duct *c*.

The feed-bar E is cylindrical exteriorly and fits closely in the throat of the nozzle B. The nozzle below its throat is enlarged at *g*, so that it is out of contact with the feed-bar, and lower down, at *h*, it is still further enlarged, so that it is out of contact with the pen. Thus the lower portion of the nozzle constitutes the "tubular extension" claimed in my patent No. 237,454, dated February 8, 1881, for preventing evaporation of ink and protecting the fingers from being soiled.

The pen C is placed in position on the feed-bar before the latter is inserted in the nozzle, and over the pen is slipped a ring or band, H. (Shown detached in Fig. 6.) This ring should fit so tightly over the pen and bar as to serve

to hold them firmly together while they are being inserted in the nozzle. It is preferably screw-threaded on its exterior to fit a screw-thread cut in the interior of the enlarged portion *h* of the nozzle. Upon the insertion of the pen and feed-bar into the nozzle they are rotated, in order to screw the ring H into these threads, thereby holding it firmly in position. The adjustment of the pen C to the desired position on the feed-bar may thus be accurately effected before their insertion in the holder, and when inserted the pen is clamped firmly in position. The screwing in of the ring H closes the cavity in the nozzle behind it, formed by the enlargement *g* therein, thereby converting that portion into a chamber, *i*, which is in communication with the capillary slit *a*. The ring H has notches *jj* in its inner side, which come against the surface of the pen and serve to establish communication between this chamber *i* and the inclosed space *h* beneath. Thus any ink which may work over upon the outside of the pen and which shall enter the space *h* will be drawn up into the chamber *i* by suction when the holder is inverted. Otherwise this ink would remain at the lower end of the holder, where it might pass into the usual cap (not shown) which covers the pen-point when the holder is carried in the pocket and work out through the joint thereof to the exterior of the holder.

It is not essential that the ring H be screw-threaded; or, if screw-threaded, the threads may be cut upon its interior instead of its exterior, so that it may screw onto threads cut on the exterior of the feed-bar. This construction is shown in Fig. 17. The top of the feed-bar should be recessed or cut away to a depth equal to the thickness of the pen. The feed-bar may be made somewhat conical in its threaded portion, so that as the ring H is screwed up it will be tightened upon the bar to any desired tension.

In the upper part of the holder or ink-reservoir is an adjustable capillary partition, J, preferably of hard rubber or quill. This partition is somewhat curved and is of such width that its edges bear tightly against the sides of the reservoir, so that when pushed in it retains itself in place frictionally. It may be adjusted higher or lower in the holder and may be turned to the upper or lower side thereof, if desired. The curve of this partition is such that between its convex side and the wall of the reservoir is formed a capillary space or pocket, I, which will attract to it a portion of the ink, so that the level of ink on the side of the partition forming this pocket will be higher than on the opposite side thereof. This partition will thus serve to retain the ink in the holder under capillary attraction, and will keep it from moving too freely under the influence of gravitation or during the movement of the holder while in use. Two or more partitions J may be used, arranged at different positions in the holder, as shown in Fig. 1.

By a suitable arrangement of these partitions the flow of ink may be rendered more or less free, as may be desired.

I will now proceed to describe the modified constructions illustrated in Figs. 10 to 16, inclusive.

In Fig. 10 the feed-bar has a single capillary partition placed in it, lettered G'' , and consisting of a flat piece of quill, hard rubber, &c., around which the irritant, F , is coiled or looped at f' . The irritant is not otherwise looped. The pen C is pressed in between the feed-bar and the nozzle and fastened in place by a wedge, k , which is forced in on top of it. The nozzle has a tubular extension, B' , screwed onto it. The feed-bar projects through the upper end of the nozzle, and on its projecting end is slipped a tube, E' . This tube has a capillary slit, a' , along its top, which communicates with the capillary slit a in the feed-bar E . In general the construction is similar to that shown in my Patent No. 254,175, of February 28, 1882.

Fig. 11 shows a construction of pen similar to that in my Patent No. 214,795, of April 29, 1879. There is no capillary slit a , but the feed-bar is provided with perforations communicating with the ink-reservoir above and with other perforations or small vents, nn , communicating with the under side of the pen and serving for the admission of air or discharge of ink, as the case may be. The coil of wire q serves as a capillary conduit to conduct the ink from the duct to the pen. The irritant, F , extends up through the duct in the feed-bar E and continues on up to a supplementary feed-bar, E' , being looped at intervals through both.

Fig. 12 shows a pen having a looped irritant extending through the feed-bar, with the ring H , serving to bind the pen to the feed-bar and screwing inside a tubular extension, B' , which itself screws upon the lower end of the nozzle B , thus clamping the ring H against the end of the nozzle.

Fig. 13 shows a construction wherein the ring H and tubular extension B' are both made in one piece and screwed into the end of the nozzle. The irritant, F , is looped at f , extends thence through the capillary slit a over the spiral partition G , thence down into the duct e , and through the center of the tubular partition G' . It will be understood that either of the three forms of partitions G , G' , or G'' may be used alone or in combination with either of the others, according to the precise effect desired, and that if two or more be used in combination they may be arranged in any desired order. By varying the kind of partition or the arrangement of partitions the flow of ink may be made more or less free to suit the taste of different penmen.

Fig. 14 illustrates an ordinary feed-bar such as is used in certain kinds of cheap fountain-pens, it having been altered in accordance with my present invention in order to render the pen practical and efficient. The feed-bar is a simple straight bar with a groove or gutter along its upper side which comes against

the pen. In this gutter I place one, two, or more cross-pins, G''' , and I then take an irritant, F , and loop it around these pins. The pins G''' constitute partitions in the ducts, whose operation is analogous to that of the partitions G G' .

Fig. 15 illustrates another common feed-bar used with certain cheap pens after having been altered in another way according to my invention. The feed-bar has a bore through it and a broad groove on top united by a capillary slit. I arrange bridges or partitions G'' across the groove at intervals and take an irritant, F , and loop it around these partitions, carrying its loops into the capillary slit a and letting its upper end project into the holder.

Fig. 16 represents a stylographic or stylus pen embodying my present invention. The stylus C' extends up through the conical tip and is formed with a flexible scroll or spiral, s , which constitutes its spring-seating, coming against an adjustable tube, E' , which is pressed into the nozzle from its upper end. An irritant, F , looped at f f' , extends from the chamber below this tube up through the latter and into the ink-reservoir.

I claim as my invention in a fountain-pen the following-defined novel features or combinations, substantially as hereinbefore specified, namely:

1. A fountain-pen having an irritant of non-absorbent material formed with longitudinal loops and arranged in the ink duct or passage leading from the reservoir to the writing-point.
2. A fountain-pen constructed with a reservoir and an ink-duct leading thence to the writing-point and having in said duct an irritant of non-absorbent material formed into successive longitudinal loops at intervals.
3. A fountain-pen constructed with a reservoir and an ink-duct leading therefrom, and with a capillary slit along said duct, and having an irritant extending through said duct and looped at intervals therein.
4. A fountain-pen constructed with a reservoir in its holder and with a feed bar inserted therein, with an ink-duct through said bar and a capillary slit along the same, combined with a looped irritant arranged in said ink-duct.
5. A fountain-pen constructed with a reservoir and an ink-duct leading therefrom, with one or more partitions in said duct, and with an irritant extending through said duct and looped at intervals therein.
6. A fountain-pen constructed with a reservoir and an ink-duct leading therefrom, and with a capillary slit along said duct, combined with a capillary partition in said duct and with an irritant extending through said duct.
7. A fountain-pen constructed with a reservoir and an ink-duct leading therefrom, and with a capillary slit along said duct, combined with a partition in said duct and with an irritant therein looped around said partition.
8. A fountain-pen constructed with a reservoir and an ink-duct leading therefrom, com-

bined with a capillary partition in said duct and with an irritant therein extending through said partition.

5 9. A fountain-pen constructed with a reservoir and an ink-duct leading therefrom, combined with an irritant in said duct and a capillary partition therein consisting of a strip rolled into spiral form with capillary interstices between its convolutions.

10 10. A fountain-pen constructed with a reservoir and an ink-duct leading therefrom, and with a capillary slit along said duct, combined with a capillary partition in said duct filling the same and separating it from said slit, and
15 with an irritant in said duct extending through said partition.

11. The combination, with a fountain-holder, of a removable feed-bar insertible in the nozzle thereof, and a ring, H, entering within the
20 nozzle and passing over said bar and the pen to bind them together.

12. The combination, with a fountain-holder, of a removable feed-bar insertible in the nozzle thereof and adapted to fit against the under side of the pen, a ring, H, adapted to pass
25 over said bar and bind the pen thereto, and screw-threads on said ring and in the nozzle, whereby the ring may be screwed into the nozzle upon the insertion of the feed-bar therein.

13. The combination, with a fountain-holder 30 and its nozzle, the latter having a recess, *g*, of the feed-bar fitting the throat of the nozzle, and the ring H, fitting over said bar and adapted, when inserted in the nozzle, to close the recess
g, and form thereby a suction-chamber, *i*. 35

14. The combination, with a fountain-holder, of an adjustable capillary partition, J, having the form of a section of a hollow cylinder arranged in the ink-reservoir and held in place therein by frictional contact of its edges with
40 the walls thereof.

15. The combination, with a fountain-holder, of an adjustable partition, J, having the form of a section of a hollow cylinder arranged in the reservoir, its edges binding frictionally
45 against the inner walls thereof and its convex side arranged in capillary proximity to the wall of the reservoir on one side.

In witness whereof I have hereunto signed my name in the presence of two subscribing
50 witnesses.

WILLIAM W. STEWART.

Witnesses:

ARTHUR C. FRASER,
GEORGE H. FRASER.