

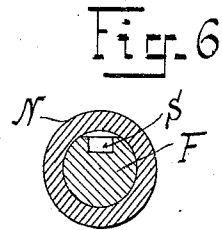
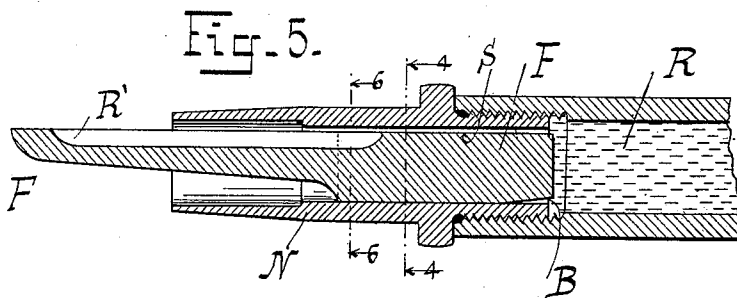
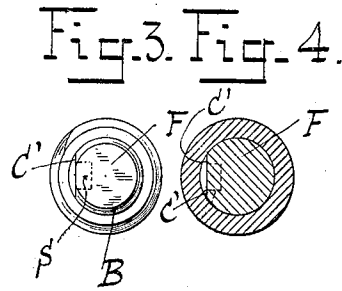
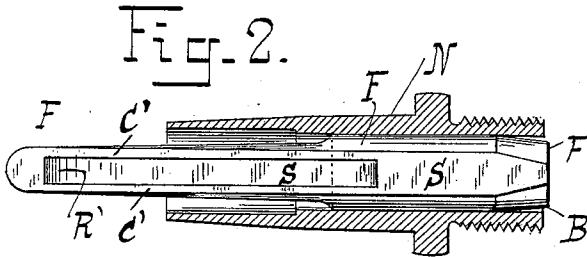
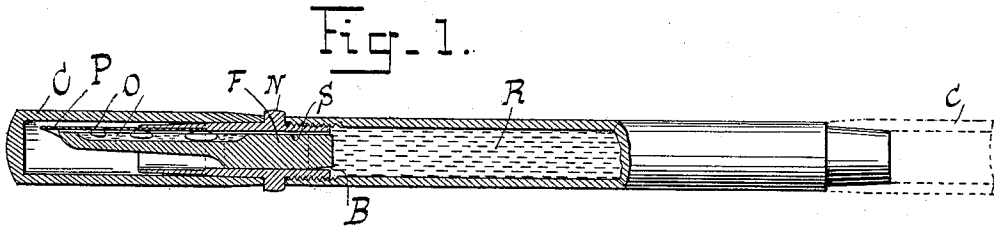
No. 607,397.

Patented July 12, 1898.

L. E. WATERMAN.
FOUNTAIN PEN.

(Application filed Aug. 24, 1897.)

(No Model.)



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FOUNTAIN-PEN.

SPECIFICATION forming part of Letters Patent No. 607,397, dated July 12, 1898.

Application filed August 24, 1897. Serial No. 649,361. (No model.)

To all whom it may concern:

Be it known that I, LEWIS E. WATERMAN, a citizen of the United States, residing in the city of New York, (Brooklyn,) county of Kings, and State of New York, have made a new and useful Invention in Fountain-Pens, of which the following is a specification.

My invention relates to improvements in fountain-pens or pens in which the ink is carried in a reservoir and fed to the writing-pen automatically by its own use; and the objects of my improvements are, first, to provide an annular or approximately annular and surface capillary channel or passage-way into which the ink first passes from the reservoir on the way to the writing-pen; second, to connect this annular surface capillary channel with one or more surface longitudinal capillary channels or passage-ways for transferring ink to the writing-pen located on and at the top of the feed-bar; third, to combine each of these surface capillary channels or passage-ways with the reservoir and the sub-reservoir under the writing-pen, and, fourth, in summation, to provide a feed-bar of a fountain-pen that transfers ink from the reservoir to the writing-pen and to the subreservoir and air from the subreservoir to the reservoir by surface feed only and without the aid of capillary fissures or grooves cut into or formed with both walls wholly in the feed-bar. I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a part sectional view of the complete pen. Fig. 2 is a horizontal sectional view of the nozzle and feed-bar. Fig. 3 is an end view of the nozzle and feed-bar. Fig. 4 is a sectional view cut on the line 4 4, Fig. 5. Fig. 5 is a sectional view of a feed-bar, nozzle, and the lower end of the reservoir; and Fig. 6 is a sectional view cut on the line 6 6, Fig. 5.

Similar letters relate to similar parts throughout the several views.

The reservoir R is provided with a nozzle N and the nozzle N with the feed-bar F. The feed-bar F is provided with the secondary reservoir R', which consists of a groove in the top of the bar, which may be long, as shown in the drawings, or extend only for a short distance back of the air-inlet O in the

writing-pen P. The feed-bar is beveled at, around, and for an eighth of an inch, more or less, in front of its rear end. In or on the top of it the feed-bar is planed off, so as to leave a middle air-space S between it and the inner surface of the nozzle and also between it and the writing-pen, under which a groove forms the secondary reservoir R', and capillary channels or passage-ways on each side of the air-space, connected at the front end, and therefore located on three sides of such secondary reservoir or such air-space.

C is the cap, which may be made in the form shown or in any other usual form.

B is the annular capillary channel, and C' C' are the side surfaces on each side of the middle space S, that connect the annular capillary channel with the pen and reservoir. These may be flat, as shown, or curved, so as to approach the opposite nozzle-surface to furnish stronger capillary action.

The method of operation of the invention is as follows: When the pen is in position for writing, the approximately annular beveled channel or passage-way B is open to receive and take the ink directly from the reservoir at all points, and the inner wall of the nozzle and the outer bevel of the feed-bar being in capillary relation thereto the ink will be carried by it to whatever capillary surfaces may be provided to conduct it to the writing-pen and to the secondary reservoir R'. The two side surfaces C' are provided for this purpose and receive the ink at the top of the feed-bar and on each side of the middle space S, of which the primary function is to supply air to the reservoir as the ink is removed therefrom by capillarity. At the outset the middle space S, although primarily an air-duct, being always open to the reservoir and to the ink contained therein, will, when the reservoir is full and except when it is almost empty, receive a portion of the ink therefrom; but when the pen is held in the writing position the ink will not escape from the reservoir nor from the secondary reservoir, and when the secondary reservoir, the middle-space air-duct, and such other spaces as there may be are filled with ink, either by gravity or by capillary action, the ink will then remain in place or quiescent until it is set in motion by the use of the writing-pen. This retention of the

ink is accomplished by the automatic closure of the air inlet or opening O in the pen. As soon as the distribution of ink from the pen-point upon the paper has opened the opening
 5 O air will enter through that opening and pass upward on its way through the air-duct space S toward the reservoir in a more or less elongated bubble form, according to the shape of the channel or air-duct, being assisted in its
 10 movement by the capillary spaces C' on each side of the air-duct S, which carry the ink around the air-bubble and thereby push the air upward toward and eventually into the reservoir. By capillary action the ink thus passes
 15 toward the point of the pen between the top of the bar at each side of the secondary reservoir and the nozzle and pen surfaces above the bar by way of the capillary channels C' between the two. These channels in turn receive their supply of ink from the annular or approximately annular channel B. By capillary action in these narrow spaces C' ink will be transferred from above the bubble downwardly or below the bubble, thus allowing the
 25 bubbled air to pass upward along the middle flat air duct or channel S until the ink reaches the pen and when in oversupply passes into the subreservoir R'. This action continues with the use of the writing-pen so long as the ink covers the inner end of the feed-bar. When the inner end of the feed-bar is so far uncovered as to open the inner end of the middle space S, the air-bubbles or the air will not pass freely and uncontrolled into the reservoir, and the remaining ink will not thereby
 35 be caused to escape into the secondary reservoir R' or to gush from the pen or from the open spaces or vent in, under, or around the same, because there is no channel or passage-way through which it can pass except by capillary action. The annular or approximately annular channel B being so formed as to control all the ink that reaches it, and not only to move but to hold onto the ink by capillarity, as the ink is drawn from the reservoir
 45 and from the contributory capillary channels on the top of the feed-bar and at the side of the middle air-space and of the subreservoir, further supply of ink will only be passed up to the inner ends of the capillary channels C', and only such ink will pass on toward the pen as is carried up in that way, and the process of lifting the ink in and by the annular passage by capillarity will continue until all the
 55 ink in the reservoir R is exhausted.

The arrangement being such that the air can only pass upward into the reservoir as the ink passes downward along the capillary channels C' on each side of it the ink in the
 60 reservoir is always under control whatever may be the condition of the reservoir as to the quantity of ink contained therein—that is, whether it is full or partly empty. The dominant and controlling element in the
 65 movement of the ink in this construction is the annular capillary channel B, which stands guard over both the capillary channels C' and

the air-space S, thus regulating the action of both and controlling also the supply of ink to the secondary reservoir R' and to the writing-pen. Another element in control for
 70 stopping the gush of ink and even the action of the capillary channel B is the air-inlet opening O in the pen or any other inlet-opening that may be provided and so located in
 75 or in relation to the feed-bar as to allow air to pass into the secondary reservoir and the air-channel above it. The simplest as well as the most scientific method is that which locates the air-inlet O in the pen at or just
 80 above the end of the split that forms the nibs of the pen, as shown. So located, the air-inlet is on the top side and therefore quicker in its action to admit air and thereby permit the capillary channels to instantly begin to
 85 deliver more ink to the secondary reservoir. While it increases the flexibility of the nibs when located at or in the upper end of the split, it can be made when the pen is made and without increase of cost, and if located
 90 higher up in some writing-pens than in others and above the split the length and capacity of the secondary reservoir may be increased without changing the other parts by simply changing writing-pens. This may become a
 95 matter of material advantage where it is desirable to use a coarser pen-point requiring a larger supply of ink to or in the reservoir without changing the other parts of the fountain or holder. The air-inlet may, however,
 100 be located in or consist of an opening through the feed-bar at some point above the lower end of the groove or air-duct S. The most objectionable way of making it would be by cutting a groove across one or both of the
 105 capillary surfaces at the side of the air-duct S, since that would interfere with continuity of capillary action. If made as a perforation in and through the feed-bar to the air duct or groove, it should be located higher up—
 110 that is, at the end of the ink-slope—in order to keep the same ink-supply in the secondary reservoir and act as promptly as possible. In that case it would be necessary to change the feed-bar to give a larger secondary reservoir
 115 and ink-supply for a coarser pen. In other respects the best location for the air-inlet is in or through the writing-pen, which consists of a thin plate that will limit the capillary hold and danger of detention of ink in the
 120 hole, whereas if made in the feed-bar, which is thicker, the ink will be held therein longer and with more tenacity because of capillary action, which will be assisted by gravity to keep the ink in the hole, whereas gravity as-
 125 sists in removing the ink and opening the air-inlet when located on the upper side and through the writing-pen.

As shown, the circular capillary channel or passage-way B is made by beveling the inner
 130 end of the feed-bar circumferentially for a sufficient distance and not far enough to destroy capillary coöperation between it and the opposite inner surface of the nozzle at or near

its inner end. I do not, however, desire to confine my invention to this method of forming this curved capillary channel or passage-way, since it is evident that a similar channel may be formed practically at or opposite the same place by leaving the plug portion of the feed-bar straight or unbeveled or of the same diameter throughout, excepting, of course, at the top, where the feed-bar is planed off flat or otherwise shaped to form a longitudinal air duct or channel and two longitudinal capillary channels C' on top of the plug part of the feed-bar, and the bevel to form the circular channel may be then obtained or produced by cutting away the inner surface of the nozzle instead of the feed-bar.

I have shown the cut made across the top of the feed-bar as flat all the way across. I do not desire to confine myself to that precise shape, since it is evident that, when desired, increased capillary action may be secured by curving the cut at the sides farther over on the outer sides of the feed-bar, and in so doing it is evident that increased capillary surfaces may be obtained upon each side of the air-space S; nor do I desire to confine myself strictly to an air duct or space with a flat floor or cut flat clear across the feed-bar, as it is evident that that line may be made even an outwardly-curved or angular line and yet leave sufficient space or surface for an air-channel and abundant space at the side for a capillary channel.

It should be stated that when the reservoir is full and almost up to the time when it becomes empty the ink is in contact with the inner ends of the top surface capillary channels and passage-ways and will transfer the ink from the reservoir to the subreservoir in the absence of the annular capillary channel or when it may become clogged by sediment. When unclogged, the annular channel may have the stronger capillary power and becomes particularly effective when the reservoir is almost empty and the top surface of the ink does not reach up to the inner end of the longitudinal capillary passage-ways. The capillary surfaces differ from fissure-surfaces in that they are two separate flat or plate surfaces.

I claim as my invention—

1. A feed-bar of a fountain-pen externally beveled at and near the inner end of its plug portion so as to form, when in place in the nozzle, a capillary channel and passage-way for ink on the way from the reservoir to the pen, bounded on one side by the beveled surface of the feed-bar and on the other by the opposite inner surface of the nozzle, in combination with one or more capillary channels connecting such capillary channel and passage-way with the split in the writing-pen.

2. A fountain-pen provided with an annular capillary channel and passage-way for ink from the reservoir on its way to the pen, formed between the feed-bar and the nozzle at and adjoining the inner end of the plug

portion, substantially as shown and described, in combination with one or more capillary channels connecting such capillary channel and passage-way with the split in the writing-pen.

3. A fountain-pen provided with an annular capillary channel and passage-way for ink between the feed-bar at and near the inner end of its plug part and the adjacent surface of the nozzle, in combination with one or more capillary channels connecting such capillary channel and passage-way with the split in the writing-pen.

4. A fountain-pen provided with an annular capillary channel and passage-way for ink formed at and around the inner end of the plug part of the feed-bar, in combination with one or more capillary channels connecting such capillary channel and passage-way with the split in the writing-pen.

5. A feed-bar of a fountain-pen beveled externally at and in front of the inner plug end so as to form a capillary channel or passage-way for ink from the reservoir, substantially in the manner and for the purpose set forth, in combination with one or more capillary channels connecting such capillary channel and passage-way with the split in the writing-pen.

6. A feed-bar of a fountain-pen beveled externally at and in front of the inner end so as to form an annular capillary channel and passage-way for ink, substantially as shown and described, in combination with a flat air-duct surface and channel on the top of the plug portion of the feed-bar and with a capillary channel or channels, passage-way or passage-ways, at one or both sides of the flat air-duct surface extending to and under the pen.

7. A feed-bar of a fountain-pen beveled externally at and in front of the inner end so as to form an annular capillary channel and passage-way for ink, substantially as shown and described, in combination with a flat air-duct surface and channel on the top of the plug portion of the feed-bar and with a capillary channel or channels, passage-way or passage-ways, at one or both sides of the flat air-duct surface extending to and under the pen and to the nibs or the split in the pen.

8. A feed-bar of a fountain-pen beveled externally at and in front of the inner end so as to form an annular capillary channel and passage-way for ink, substantially as shown and described, in combination with a flat air-duct surface and channel on the top of the plug portion of the feed-bar, with a capillary channel or channels, passage-way or passage-ways, at one or both sides of the flat air-duct surface extending to and under the pen, and also with a secondary reservoir located under the pen.

9. A feed-bar of a fountain-pen beveled externally at and in front of the inner end so as to form an annular capillary channel and passage-way for ink, substantially as shown

and described, in combination with a flat air-duct surface and channel on the top of the plug portion of the feed-bar, with a capillary channel or channels, passage-way or passage-ways, at one or both sides of the flat air-duct surface extending to and under the pen, and also with a secondary reservoir located under the pen and provided with an air-inlet through or under the pen.

10 10. In fountain-pens, a feed-bar provided with a secondary ink-reservoir located under the nibs of the writing-pen and in a groove or channel located on the top side of the feed-bar, and also provided on one or both sides
15 of the secondary reservoir and on the top side of the feed-bar with a flat, horizontal or plate capillary channel or passage-way for ink connecting at one end with the secondary reservoir and with the nibs of the writing-pen and
20 at the other end with the main reservoir through a continuous or connecting capillary channel located on the top of the plug portion of the feed-bar, an air-inlet being provided for the admission of air into the groove
25 or channel above its lower end, substantially as shown and described.

11. In fountain-pens, a feed-bar provided with a secondary ink-reservoir located under the nibs of the writing-pen and in a groove
30 or channel located on the top side of the feed-bar, and also provided on one or both sides of the secondary reservoir and on the top side of the feed-bar with a flat, horizontal or plate capillary channel or passage-way for ink connecting at one end with the secondary reservoir
35 and with the nibs of the writing-pen and at the other end with the main reservoir through a continuous or connecting capillary channel located on the top of the plug portion of the feed-bar, and also provided with
40 an air-inlet connecting with the groove or channel on the top of the feed-bar above its lower end for admitting air to the main reservoir as the ink is drawn therefrom by capillary
45 action.

12. In fountain-pens, a feed-bar provided with a secondary ink-reservoir located under the nibs of the writing-pen and in a groove
50 or channel located on the top side of the feed-bar, and also provided on one or both sides of the secondary reservoir and on the top side of the feed-bar with a flat or horizontal capillary channel or passage-way for ink connecting at one end with the secondary reservoir
55 and with the nibs of the writing-pen and at the other end with the main reservoir through a continuous or connecting capillary channel located on the top of the plug portion of the

feed-bar, and also provided with an air-inlet connecting with the groove or channel on the
60 top of the feed-bar above its lower end for admitting air to the main reservoir as the ink is drawn therefrom by capillary action, located between the capillary channels on each side of the groove or channel in which the
65 secondary reservoir is located.

13. In fountain-pens, a feed-bar provided with a secondary ink-reservoir located under the nibs of the writing-pen and in a groove
70 or channel located on the top side of the feed-bar, and also provided on one or both sides of the secondary reservoir and on the top side of the feed-bar with a flat or horizontal capillary channel or passage-way for ink connecting at one end with the secondary reservoir
75 and with the nibs of the writing-pen and at the other end with the main reservoir through a continuous or connecting capillary channel located on the top of the plug portion of the feed-bar, and also provided with an air-inlet
80 connecting with the groove or channel on the top of the feed-bar above its lower end for admitting air to the main reservoir as the ink is drawn therefrom by capillary action, located adjacent to the capillary channel on
85 each side of the groove or channel in which the secondary reservoir is located.

14. In fountain-pens, a feed-bar provided with a secondary ink-reservoir located under the nibs of the writing-pen and in a groove
90 or channel located on the top side of the feed-bar, and also provided on one or both sides of the secondary reservoir and on the top side of the feed-bar with a flat or horizontal capillary channel or passage-way for ink connect-
95 ing at one end with the secondary reservoir and with the nibs of the writing-pen and at the other end with the main reservoir through a continuous or connecting capillary channel located on the top of the plug portion of the
100 feed-bar, and also provided with an air-inlet for admitting air to the main reservoir as the ink is drawn therefrom by capillary action, located adjacent to the capillary channel on each side of the groove or channel in which
105 the secondary reservoir is located, the writing-pen being provided with an air-inlet opening located at or above the upper end of the split forming the nibs of the writing-pen and connecting with the groove or channel in the
110 top of the feed-bar above its lower end.

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