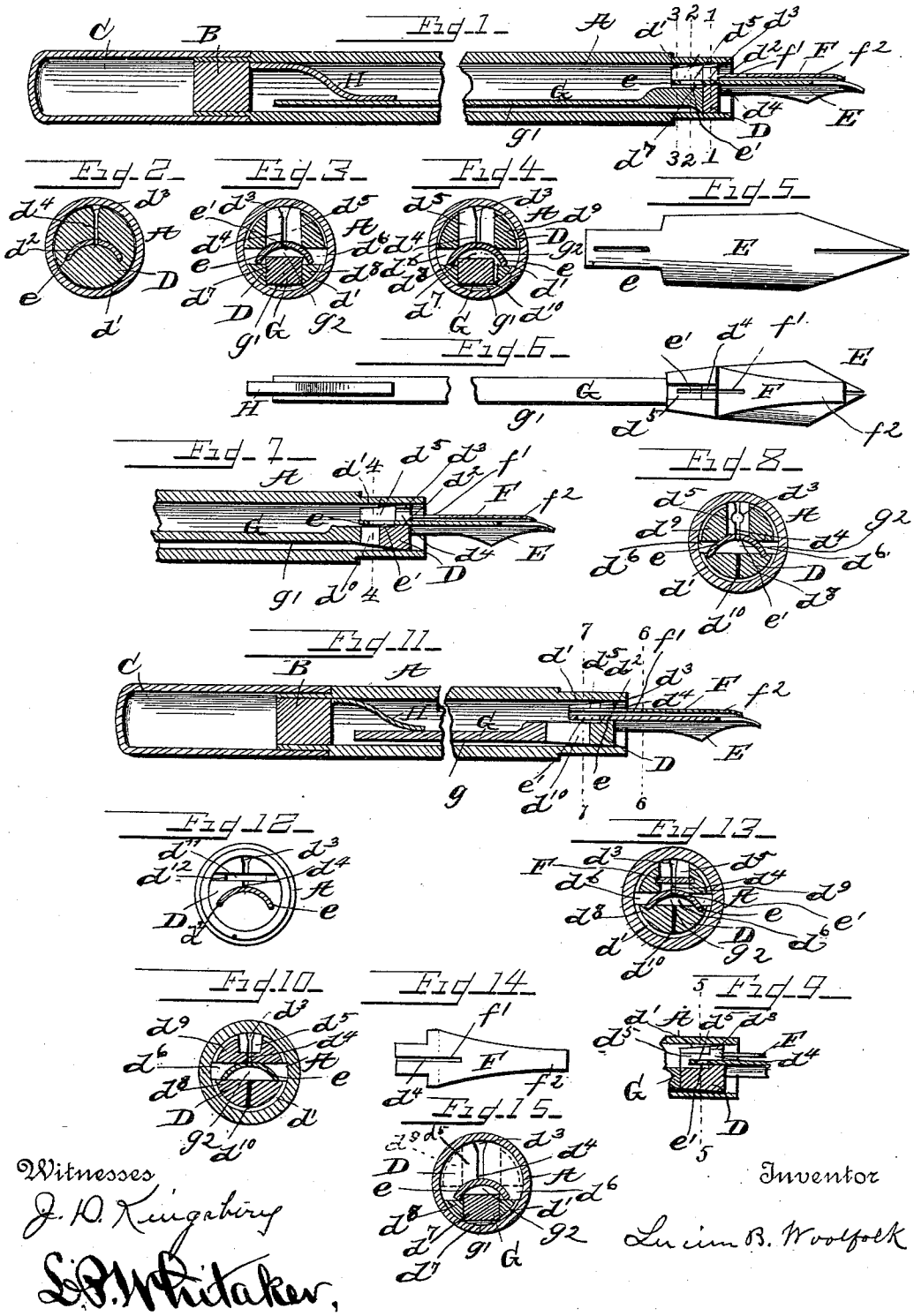
(No Model.)

L. B. WOOLFOLK.

FOUNTAIN PEN.

No. 457,470. Patented Aug. 11, 1891.



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FOUNTAIN-PEN.

SPECIFICATION forming part of Letters Patent No. 457,470, dated August 11, 1891.

Application filed January 13, 1891. Serial No. 377,660. (No model.)

To all whom it may concern:

Be it known that I, LUCIEN B. WOOLFOLK, a citizen of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Fountain-Pens; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention belongs to that class of fountain-pens in which the handle or ink-holder is permanently closed at the top by a plug and is provided with a movable pen-holding stopper at the lower end of the ink-holder, which is pierced with a transverse slot for holding the pen, and has a feed-tongue back of the pen, supplying the pen with what is known as "back" or "top" feed.

The first object of my invention is to provide an ink-duct, through which ink may flow to the pen, and an air-aperture, through which air will enter the ink-holder, both constructed in the same longitudinal slot, so as to allow the air and ink to pass in opposite directions without interference and obstruction between them, thus securing a regular, uninterrupted, and free flow of ink to the pen. I obtain this end by providing a longitudinal slot for supplying ink to the pen and air to the ink-holder through an ink-duct and air-aperture therein, which is at right angles with the transverse slot for holding the pen and extending from the back of the pen out to the circumference of the pen-holding stopper; but this construction is attended with a disadvantage that it weakens the pen-holding stopper. In practice it is found that the transverse slot for holding the pen almost severs the pen-holding stopper into two parts, the corners of said transverse slot approaching very close to the circumference of the pen-holding stopper. When the longitudinal slot for supplying ink to the pen and air to the ink-holder is made and the transverse slot aforesaid is pierced, the pen-holding stopper, holding together only by the very little substance left between the corners of the aforesaid transverse slot and circumference of the pen-holding stopper, is so much weakened as to be in danger of breaking apart. This weakness can only be remedied by lengthening the pen-holding stopper; but lengthening the pen-holding stopper is attended with several grave difficulties: First, a long pen-holding stopper is difficult of removal from the ink-holder when it is necessary to fill the fountain-pen; second, by lengthening the pen-holding stopper the air-aperture through it is lengthened, and when it is full of ink, the ink, held by the capillary attraction against the walls of the air-aperture, resists the entrance of air into the pen-holding stopper, and thus checks the flow of ink to the pen; third, by lengthening the pen-holding stopper the ink-duct through it is also lengthened, and when the walls of the ink-duct become dry the ink will not flow through it, which causes constant trouble, fountain-pens frequently failing to work properly from this cause; fourth, but the great difficulty of a long pen-holding stopper is the difficulty of construction. The difficulty of piercing a transverse slot for holding the pen increases in an accelerated ratio with the length of the pen-holding stopper, so that it is impossible to pierce the transverse slot for the pen through a long pen-holding stopper. It is also difficult to pierce the longitudinal slot for supplying ink to the pen and air to the ink-holder through a long pen-holding stopper. My invention meets all these difficulties. It provides a pen-holding stopper long enough to give it adequate strength where it is cut by the transverse slot for holding the pen, and at the same time it obviates all the disadvantages of a long pen-holding stopper. The pen-holding stopper is made easy of removal from the ink-holder by being gently sloped, and the inner or upper end of the pen-holding stopper is cut away so as to form a transverse groove in that portion of it that is traversed by the transverse slot for holding the pen, and also to form a longitudinal groove in that portion that is traversed by the longitudinal slot for supplying ink to the pen and air to the ink-holder, making the pen-holding stopper very thin in those portions. Thus all the strength of a long pen-holding stopper is secured, combined with the advantages of a very short pen-holding stopper or disk. Moreover, by means of the aforesaid transverse and longitudinal grooves, other advantages are incidentally secured in the construction and op-

eration of my invention, which will be hereinafter set forth, together with other points of the invention to which present allusion cannot be made.

In the accompanying drawings, the figures are considerably enlarged beyond the size of a fountain-pen in order the better to represent the various parts.

The preferred form of my invention is represented in Figures 1, 2, 3, 4, 5, and 6. Fig. 1 is a longitudinal section. Fig. 2 is a cross-section through the line 1 1 of Fig. 1, looking toward the point of the pen. Fig. 3 is a cross-section through the line 2 2 of Fig. 1, looking toward the point of the pen. Fig. 4 is a cross-section through the line 3 3 of Fig. 1, looking toward the point of the pen. Fig. 5 is a plan view of the pen detached. Fig. 6 is a plan view of the feed apparatus detached.

A modification of my invention is presented in Figs. 7 and 8, of which Fig. 7 is a longitudinal section of the lower portion of the fountain-pen, and Fig. 8 is a cross-section through the line 4 4 of Fig. 7, looking toward the point of the pen.

Another modification of my invention is represented in Figs. 9 and 10. Fig. 9 is a detail longitudinal section of the lower part of the fountain-pen, and Fig. 10 is a cross-section through the line 5 5 of Fig. 9, looking toward the point of the pen.

Another modification of my invention is represented in Figs. 11, 12, 13, and 14. Fig. 11 is a longitudinal section. Fig. 12 is an end view with the feed-tongue removed, through the line 6 6 of Fig. 11. Fig. 13 is a cross-section through the line 7 7 of Fig. 11, looking toward the point of the pen. Fig. 14 is a detached plan view of the feed-tongue. Fig. 15 is a cross-section through line 2 2 of Fig. 1, looking toward the point of pen, with the projections d^9 left out.

In the drawings similar parts are designated by similar letters.

A represents the ink-holder, which is permanently closed at the upper end by the plug B. The ink-holder A has turned flanges on either end, on which fits the cap C, of usual construction. The cap C is represented in the drawings as fitted on the upper end of the ink-holder.

D is the movable pen-holding stopper, which is to be removed for filling the ink-holder with ink. In the drawings the pen-holding stopper is represented as placed slightly within the lower end of the ink-holder. This construction is desirable, as furnishing a cup or recess below the pen-holding stopper for catching and holding by capillary attraction any overflow of ink caused by the expansion of air in the ink-holder from being heated by the hand, the only cause which in my invention ever causes any overflow. Aside from this advantage, my invention will work equally well with the lower end of the pen-holding stopper flush with or slightly protruding from the lower end of the ink-holder, and it may be operated in that manner, if preferred.

The pen-holding stopper D is preferably sloped from a point a little above the lower end thereof to the upper end. This slope has two advantages. It makes the pen-holding stopper easily removable from the ink-holder, and the sloped portion forms an ink-channel d' around the pen-holding stopper, which is efficient for supplying ink to the pen and returning ink to the ink-holder when the position of the fountain-pen is reversed; but this slope of the pen-holding stopper is not an essential part of my invention. The pen-holding stopper will be more easily manufactured of a uniform diameter from end to end, and my invention will work equally well if the pen-holding stopper is made of the same diameter from end to end, and it may be constructed in that form, if it is preferred.

The pen-holding stopper D is pierced with a transverse slot d^2 for holding the pen E, which is provided with a pen-shank e, that fits in the transverse slot d^2.

The pen-holding stopper D is provided with a longitudinal slot for supplying ink to the pen and air to the ink-holder. This longitudinal slot is at right angles with the transverse slot for holding the pen and extends from the back of the pen to the circumference of the pen-holding stopper. The longitudinal slot is made continuous, in order that the ink-duct may be readily cleared of all obstructions with the point of a knife or other instrument. The outer portion of this longitudinal slot is enlarged to form an air-aperture d^3 for the admission of air into the ink-holder. In the preferred form of my invention the air-aperture has a flared shape; but any other shape will answer equally well for the passage of air into the ink-holder. The air-aperture may be a circular or an oblong hole extending to the circumference of the pen-holding stopper, or the air-aperture may be an aperture of any desired form that does not extend to the circumference of the pen-holding stopper, as is seen in Figs. 7 and 8. The inner portion of the aforesaid longitudinal slot is very narrow and constitutes an ink-duct d^4 for the passage of ink from the ink-holder through the pen-holding stopper to the pen. This ink-duct at the bottom of the said longitudinal slot is in contact with the back of the pen-shank until it reaches the main body of the pen.

The pen-holding stopper D has a portion of its inner or upper end cut away. A transverse groove is cut away across the inner or upper end of the pen-holding stopper, and a longitudinal groove is cut away extending to the circumference of the pen-holding stopper back of the pen and including within it all the space of the longitudinal slot for supplying ink to the pen and air to the ink-holder. The aforesaid grooves are designated as follows: The longitudinal groove extends from

the back of the pen-shank to the circumference of the pen-holding stopper back of the pen and is designated the "longitudinal groove" d^5. The top boundary of the transverse groove is its top wall, extending from either side of the pen-holding stopper to the point where said top wall strikes the top side of the pen-shank, and thence around the top of the pen-shank. This transverse groove is designated as the "transverse groove" d^6. The transverse groove d^6 covers the space occupied by the transverse slot d^2 for holding the pen and is situated immediately above said transverse slot. It therefore makes the pen-holding stopper short or thin in the area where the said transverse slot for holding the pen is pierced, and greatly facilitates the piercing of the said transverse slot through the pen-holding stopper, for the transverse slot for holding the pen is much more easily pierced through a short space, and the difficulty of piercing it increases in an increasing ratio with the length of the pen-holding stopper to be pierced. To facilitate the piercing of the transverse slot for holding the pen by means of the transverse slot d^6 is one of the most important aims of my invention.

In the preferred form of my invention the walls of the longitudinal groove d^5 strike the back of the pen-shank at or very near the same point where the back of the pen-shank is struck by the top wall of the transverse groove d^6. The two grooves aforesaid may be made of any width relatively to each other the manufacturer prefers, provided the walls of the longitudinal groove d^5 and the top wall of the transverse groove d^6 shall be so adjusted as to strike the pen-shank at or very nearly at the same point. By this means the two grooves occupy the space that would be traversed by the transverse slot for holding the pen, if said transverse slot were pierced through to the upper end of the pen-holding stopper. So that this end is attained it matters not what is the relative width of the two grooves aforesaid to each other. If the longitudinal groove is made narrower, so as to strike the pen-shank near its top, then the top wall of the transverse groove is made higher up, so as to strike the pen-shank at or near the same point. On the other hand, if the longitudinal groove is made wider, so that its walls strike the pen-shank lower down on its sides, then the top wall of the transverse groove must be made lower down, so as to strike the pen-shank at or near the same point as the walls of the longitudinal groove. So that this condition be complied with, the two grooves may be made of any preferred width relative to each other, since in all cases the two grooves will occupy the space of the transverse slot for holding the pen so as to facilitate the piercing of said slot.

It may in practice be found preferable to slightly narrow the two grooves aforesaid, so as to have them cover not quite all the space occupied by the transverse slot for holding the pen, so that in piercing the transverse slot for holding the pen the instrument may slightly furrow the bottom wall of the transverse groove d^6 where the corners of the pen-shank rest, and may slightly shave away the corners that touch the back of the pen-shank. This construction is represented in Fig. 8, which is not designed to represent a difference of construction, but only such a slight narrowing of the grooves d^5 and d^6 as will not increase the difficulty of piercing the transverse slot for holding the pen, while it leaves enough to be shaved away to insure an accurate fit around the pen-shank.

The position of the longitudinal groove d^5 in the pen-holding stopper is immediately above the longitudinal slot, so that the said longitudinal slot is constructed through the pen-holding stopper from the lower end thereof into the longitudinal groove d^5. Hence the longitudinal groove d^5 facilitates the construction of the said longitudinal slot, making the pen-holding stopper short or thin at the point where said longitudinal slot is pierced. The longitudinal groove d^5 is also of the highest importance for shortening the air-aperture d^3 and the ink-duct d^4, which are situated in the said longitudinal slot, for the longitudinal slot for supplying ink to the pen and air to the ink-holder being pierced through the thin portion of the pen-holding stopper from the lower end thereof into the longitudinal groove d^5, the ink-duct and the air-aperture are both made very short, thus greatly facilitating the regular and uninterrupted flow of ink and air through the pen-holding stopper.

The advantages of a short ink-duct are very great. An ink-duct is only efficient in causing the flow of ink by capillary attraction when it is damp. When dry, its adjacent surfaces repel the passage of liquids. A long ink-duct is liable to get dry in a very short time, when it will not conduct the ink to the pen, causing great trouble to get the pen started after being laid aside or held in the hand during a pause in writing. This is one of the most frequent causes of trouble with fountain-pens, for when a long ink-duct becomes dry it repels the entrance of ink into it, so that it is difficult to moisten it. This difficulty is obviated in my invention by making the ink-duct short by forming the longitudinal groove d^5 in the upper portion of the pen-holding stopper immediately above the ink-duct. The advantages of shortening the air-aperture are almost equally great. The ink in a long air-aperture clings to its walls by capillary attractions and offers great resistance to the ingress of air into the ink-holder. This resistance of the ink prevents the ingress of air until the vacuum within the ink-holder is great enough to exert sufficiently intense action to overcome the resistance of the ink, the ink meantime flowing meagerly to the pen, causing frequent "skips," and when

the violent action of the vacuum at last overcomes the resistance of the ink in the air-aperture the air rushes into the ink-holder in great force and in excessive volume, causing an outgush of ink. This is all obviated in my invention by shortening the air-aperture by forming the longitudinal groove d^5 in that portion of the inner or upper end of the pen-holding stopper that lies above the air-aperture.

The shortening of the ink-duct and of the air-aperture by forming the longitudinal groove d^5 in the inner or upper end of the pen-holding stopper immediately above the ink-duct and air-aperture is one important aim of my invention.

Besides the advantages of shortening the ink-duct and the air-aperture by means of the longitudinal groove d^5, my invention renders the ink-duct and air-aperture more efficient by constructing them in distinct parts of the longitudinal slot, so that ink and air may flow through them in opposite directions without mutual interference and conflict.

The advantages of providing an ink-duct and an air-aperture through the pen-holding stopper situated in distinct parts of the longitudinal slot are very great. When there is but a single passage for the passage of both ink and air, the ink continues to flow to the pen until there is a vacuum formed in the ink-holder. This vacuum checks the flow of ink to the pen, both by the direct action of the vacuum holding it back and also by the ink being obstructed by the air that is tending to be drawn in to supply the vacuum. This check to the flow of the ink to the pen by the conjoint action of the back suction of the vacuum and the active obstruction of the air continues with a meager flow of ink to the pen and frequent skips, until at length the action of the vacuum becomes so powerful as to draw the air in with a great inrush, followed by an outgush of ink. Consequently fountain-pens with only one passage for both ink and air are liable to alternate "skippings" and "gushings" or "weeping" from this radical defect of construction. All this is avoided in my invention by providing an ink-duct and air-aperture distinct from each other. The air entering the ink-holder never interferes with the outflow of ink through the ink-duct. The outflow of ink never interferes with the inflow of air required to fill the vacuum in the ink-holder caused by the outflow of ink.

The transverse groove d^6 and the longitudinal groove d^5 exert important functions in my invention, hereinbefore mentioned. The transverse groove d^6 makes the pen-holding stopper short or thin at the point where it is pierced by the transverse slot for holding the pen, thereby greatly facilitating the piercing of said transverse slot. The longitudinal groove d^5 makes the pen-holding stopper short or thin at the point where the longitudinal slot is constructed, thereby facilitating the construction of said longitudinal slot. The longitudinal groove d^5 also exerts an important office in cutting short the ink-duct and air-aperture.

Besides the above offices of the longitudinal groove d^5, said groove exerts two other important offices in my invention. First, it serves the purpose of a feed-chamber, in which the ink is held by the capillary attraction of its walls, thus maintaining a constant supply of ink in contact with the ink-duct d^4 as long as any ink remains in the ink-holder, and, second, the longitudinal groove d^5 also acts as a water-seal to the longitudinal slot, keeping said longitudinal slot closed up in such a manner as to prevent any sudden "outgushes" of ink when the position of the fountain-pen is reversed.

I also construct a groove d^7 in the inner or upper end of the pen-holding stopper, extending from the transverse groove d^6 to the circumference of the pen-holding stopper below the pen-shank; but the groove d^7 has nothing to do with the transverse slot for holding the pen nor with the longitudinal slot nor the ink-duct nor the air-aperture. Its only office is to afford a secure bearing to the feed-bar, as will be hereinafter set forth. The groove d^7 may be made of any width that may be desired for the feed-bar, and this groove d^7 may be dispensed with, if so desired, as is represented in Figs. 7, 8, 9, 10, 11, 12, and 13, and its absence will not impair or affect in any manner the offices effected by the transverse groove d^6 and the longitudinal groove d^5 in my invention.

d^8 are projections situated on the bottom side of the transverse groove d^6, the bottom wall of the transverse groove d^6 being the top wall of the projections d^8. The projections d^8 exercise three important offices in my invention: First. By lengthening the pen-holding stopper in those portions adjacent to the corners of the pen-shank they strengthen the pen-holding stopper, almost severed by the transverse slot d^2 for holding the pen. My drawings exhibit the fact that the transverse slot d^2 almost severs the pen-holding stopper, and when the pen-holding stopper is further weakened by the longitudinal slot it needs to be strengthened. This strengthening is effected by having the pen-holding stopper of a good length, and by leaving (not cut away) the projections adjacent to the pen-shank where the pen-holding stopper is most nearly severed by the transverse slot for holding the pen, for this weak portion of the pen-holding stopper is stronger in proportion to its length, inasmuch as it may be strengthened by lengthening it, as well as by making it thicker. Second. The projections d^8 exercise another important office in my invention in supporting the corners of the pen-shank. Third. The projections d^8 also exert an important office in affording a secure attachment to the feed-bar, as will be hereinafter set forth.

The projections d^3 are divided from each

other by the groove d^7, formed for the purpose of affording a secure bearing to the feed-bar. The presence of the groove d^7 has no effect upon the offices of the projections d^8 in strengthening the pen-holding stopper and in supporting the corners of the pen-shank. Those offices would be equally performed if there were no groove d^7, and if the bottom wall of the transverse groove d^6 extended unbroken across the pen-holding stopper.

The projections d^9 are situated on the top side of the transverse groove d^6, and on either side of the longitudinal groove d^5. The projections d^9 exert several important offices in my invention. First. Their corners bear upon the back of the pen-shank and hold it securely between them and the projections d^8. Second. There is also formed between them the longitudinal groove d^5, which, as we have seen, serves important offices in my invention.

It is necessary to carefully distinguish between the functions performed by the cut-away longitudinal and transverse grooves and those performed by the projections of the pen-holding stopper in order to mark the scope of my invention.

In Fig. 15 all the functions of the cut-away transverse groove d^6 and the longitudinal groove d^5 are performed, except the function of the longitudinal groove d^5 in acting as a feed-chamber to the ink-duct, and a water seal to the longitudinal slot for supplying ink to the pen and air to the ink-holder.

It is evident that the form of the transverse and longitudinal grooves may be greatly varied without impairing the performance of their functions in my invention. Such modifications of form are not a change of the practical offices of the grooves aforesaid, but only a modification of the form of the projections d^9, and the shape of those projections may be modified in any manner that may be desired, or they may even be dispensed with altogether, without impairing the functions of the transverse groove d^6 or the functions of the longitudinal groove d^5, except as a feed-chamber and a water-seal, and any form may be given to the portion of the pen-holding stopper that is cut away in the inner or upper end thereof above the transverse slot for holding the pen and the longitudinal slot that will answer the purposes, hereinbefore mentioned, for which the transverse and longitudinal grooves are cut. The essential feature of my invention is not so much any special form of the portion of the pen-holding stopper that is cut away as the fact of cutting away the inner or upper end of the pen-holding stopper above the transverse slot for holding the pen and the longitudinal slot so as to facilitate their construction. As has been mentioned, the pen-shank e fits into the transverse slot d^2, and it extends beyond the transverse slot d^2 into and between the transverse groove d^6 and the longitudinal groove d^5, where it is firmly held between the projections d^8, which support the corners of the pen-shank and the projections d^9, which bear upon the back thereof.

In the preferred form of my invention the pen-shank e is represented as extending entirely through the pen-holding stopper to the upper end thereof; but it is not essential in my invention that the end of the pen-shank should extend just to the upper end of the pen-holding stopper. It may stop short of the upper end of the pen-holding stopper, as is represented in Fig. 9, or it may extend beyond the inner or upper end of the pen-holding stopper, if desired. It is only necessary that the pen-shank should extend beyond the transverse slot for holding the pen into the space beyond it, and there be supported by the projections, as aforesaid.

The pen-shank e is provided with a slot e' to allow the passage of ink from the groove d^7 into the cut-away longitudinal groove d^5 and back from d^5 into d^7. This is an important construction both for the supply of ink to the pen and for the return of ink to the ink-holder when the position thereof is reversed. The slot e' preferably does not extend to the end of the pen-shank, in order that the strength of the pen-shank may not be impaired and in order to facilitate removing the pen by pressing upon the solid end of the pen-shank; but the slot e' in the pen-shank may be extended out to the end of the pen-shank, if that construction should be preferred.

The pen E is provided with beveled shoulders, which fit into a beveled recess prepared for them in the pen-holding stopper, thus giving the pen a firmer bearing in its socket.

At the back of the pen E is the feed-tongue F for the purpose of supplying ink to the pen, which flows through the ink-duct into the space between the pen and the feed-tongue down to the point of the pen. The feed-tongue F is provided with the ink-slot f', which is in direct connection with the ink-duct d^4 and also with the ink-channel f^2 between the pen E and the feed-tongue F; but the ink-slot f' is not essential to the successful working of the feed-tongue, and may be left out, if preferred. The feed-tongue F is preferably constructed integral with the pen-holding stopper D; but it may be constructed separately and attached thereto in any suitable manner.

The feed-bar G extends back toward the upper end of the ink-holder A. It is firmly held against the inner wall of the ink-holder A, forming an ink-channel g' between it and the inner wall of the ink-holder, which conducts ink by capillary attraction from the upper end of the ink-holder down to the pen-holding stopper D. I find in practice that when the ink reaches the pen-holding stopper it passes around the same in the ink-channel d' and reaches the ink-duct very readily. Still, I prepare a special channel from the feed-bar to the ink-duct, both to supply ink to the pen and for the purpose of conveying the ink back from the pen into the ink-holder

when the position of the fountain-pen is reversed. The ink passes from the feed-bar through the ink-channel d^{10} to the ink-channel g^2 between the feed-bar and the pen-shank, whence it passes through the slot e' into the longitudinal groove d^5 and on to the ink-duct d^4.

The feed-bar G is preferably attached to the pen-holding stopper D by being fitted into the groove d^7, and may be additionally attached to the pen-holding stopper in any suitable manner; but it is not essential to my invention that the feed-bar G should be fitted into the groove d^7. The pen-holding stopper may be left solid below the pen, and the feed-bar G may be equally well attached to that solid portion.

The spring H is attached to the feed-bar G in order to hold said feed-bar firmly against the inner wall of the ink-holder by its pressure against the opposite side of the inner wall. The spring H is extended beyond the end of the feed-bar G to such a point as to regulate, by striking the plug B, the proper position of the pen-holding stopper D in the ink-holder A.

In Figs. 7 and 8 a modification of my invention is presented. In this modification the air-aperture is near the middle of the longitudinal slot. The said longitudinal slot is continued to the circumference of the pen-holding stopper, chiefly to facilitate cleaning the ink-duct when clogged by deposits from the ink, which can be readily effected with the point of a knife-blade. In this modification groove d^7 is dispensed with, and the feed-bar is attached to the solid end of the pen-holding stopper in any suitable manner. The ink-channel d^{10} is provided in the end of the pen-holding stopper. In this modification the longitudinal and transverse grooves are made a little smaller, and the projections are correspondingly larger, so that the projecting portion d^8 is slightly grooved to receive the corners of the pen-shank, and the corners of the projections d^9 are slightly shaved off, so as to fit closely upon the pen-shank. The object of this, as has been already stated, is not a difference of construction, but merely such a very slight enlargement of the projections as will not increase the difficulty of piercing the transverse slot for holding the pen, but only shave away enough to insure an accurate fit of the projections around the pen-shank.

In Figs. 9 and 10 another modification of my invention is presented. This modification differs from that in Figs. 7 and 8 in two respects: first, a portion of the pen-holding stopper is left not cut away between the cut-away longitudinal groove d^5 and the pen-shank, in which the ink-duct d^4 is constructed. This is a good arrangement, and will operate as well as other forms of my invention, the chief objection to it being that it is somewhat more difficult of construction than the preferred form; second, this modification also differs from the modification in Figs. 7 and 8 in that the extreme top of the back of the pen-shank is touched by the projecting portion instead of the sides thereof, being held by the corners of the projections d^9, the top wall of the transverse groove d^6 in this modification passing just back of the pen-shank. This modification also lacks the groove d^7, and in this modification the pen-shank is shortened, so that it does not extend to the inner or upper end of the pen-holding stopper.

In Figs. 11, 12, 13, and 14 is presented another modification of my invention embodying several points of modification. The chief modification is that the feed-tongue F is constructed separate from the pen-holding stopper. It passes through the mortise d^{11} in Fig. 10, and when in position its sides are firmly held in grooves plowed for their reception in the projections d^9. Preferably the groove d^{12} is cut in the lower end of the pen-holding stopper, in order to facilitate piercing the pen-holding stopper with the mortise d^{11}, making it very thin where the mortise is pierced, and in order to give the feed-tongue F, with its right-angled shoulders, a firm attachment to the pen-holding stopper. The dotted lines in Fig. 14 indicate the depth to which the shoulders of the feed-tongue extend into the groove d^{12}; but the groove d^{12} is not essential to my invention and may be left out, and the feed-tongue F may fit with right-angled shoulders against the lower end of the pen-holding stopper. The feed-tongue F will be held with sufficient firmness by the mortise d^{11} and the grooves in the projections d^9, together with the right-angled shoulders of the feed-tongue. If desirable for piercing the slot d^2 and the mortise d^{11} through the pen-holding stopper, the mortise d^{11} may be made more distant from the slot d^2, and the feed-tongue F may have a shoulder underneath it in order to bring it sufficiently near to the pen. In this modification the ink-duct d^4 through the pen-holding stopper is in the feed-tongue F, and extends the full length of the projections d^9, and the ink-duct d^4 in the feed-tongue F is through its entire length in contact with the back of the pen-shank down to the large portion of the pen, and is also in contact with the cut-away longitudinal groove d^5. The feed-tongue F need only extend back a part of the length of the projections d^9, if preferred. In this modification the corners of the slot for holding the pen are somewhat deeply grooved into the projecting portion d^8, as shown in Fig. 11, and the projecting portion d^8 is prolonged beyond the end of the groove for the pen-shank. This construction greatly strengthens the pen-holding stopper in the part almost severed by the transverse slot d^2. The ink-channel d^{10} is provided in the inner or upper end of the projecting portion d^8, and the feed-bar is attached to d^8 in any suitable manner. This is a very desirable form of my invention, and preferable to the preferred form, provided it can be successfully constructed. The grooving of the

corners of the transverse slot d^2 in the projecting portion d^8 and the prolongation of the projecting portion d^3 beyond the grooves for the corners of the pen-shank greatly strengthen the pen-holding stopper where almost severed by the transverse slot d^2. In this modification groove d^7 is dispensed with; but it may be used, if preferred.

Fig. 15 presents a modification of my invention, only differing from the preferred form of my invention in that the projections d^9 are left out. These are indicated by dotted lines. The particular purpose of this modification is to show by illustration the offices of the projections of the pen-holding stopper, and it has already been used for that purpose in this specification. It also shows that if the whole of the inner or upper end of the pen-holding stopper were cut away back of the site of the transverse groove d^6 that form of the cut-away portion of the pen-holding stopper facilitates the construction of the transverse slot for holding the pen and the longitudinal slot for supplying ink to the pen and air to the ink-holder, and it also shortens the ink-duct and air-aperture.

The advantages and mode of operation of my invention are obvious to one skilled in the art. It makes the pen-holding stopper long and strong and at the same time easy of extraction from the ink-holder, and while the pen-holding stopper has all the advantages of being strengthened by its length it has none of the disadvantages of a long stopper.

My invention further provides a short ink-duct and a short air-aperture through the pen-holding stopper, thus facilitating the flow of ink to the pen and the entrance of air into the ink-holder.

My invention further provides for the regular and uninterrupted flow of ink to the pen by providing an ink-duct and air-aperture distinct one from the other, so that ink and air may pass through the pen-holding stopper in opposite directions without interfering with each other and with a perfectly free and uninterrupted flow. It furthermore provides a cut-away longitudinal groove that acts as a feed-chamber, keeping a full supply of ink in contact with the ink-duct, and which also becomes a water-seal, closing the ink-duct and air-aperture against all sudden gushes or spurts of ink when the position of the fountain-pen is suddenly reversed. It also provides ink-channels through which the ink will flow by capillary attraction from the upper end of the ink-holder to the ink-duct. These and other advantages already mentioned make my invention strong, durable, efficient, and easily kept in order. The flow of ink is constant, regular, equable, and yet so free that it cannot be overdrawn by the heaviest hand.

Having thus described my invention, what I claim is—

1. In a fountain-pen, the combination, with a pen-holding stopper, a transverse slot for holding the pen extending through the pen-holding stopper, and a longitudinal slot extending through the pen-holding stopper, of a transverse groove and a longitudinal groove in the inner or upper end of the pen-holding stopper, substantially as and for the purposes set forth.

2. In a fountain-pen, the combination, with a pen-holding stopper and a transverse slot for holding the pen extending through the pen-holding stopper, of a transverse groove in the inner or upper end of the pen-holding stopper, substantially as and for the purposes set forth.

3. In a fountain-pen, the combination, with a pen-holding stopper and a longitudinal slot extending through the pen-holding stopper, of a longitudinal groove in the inner or upper end of the pen-holding stopper, substantially as and for the purposes set forth.

4. In a fountain-pen, the combination, with a pen-holding stopper and an ink-duct extending through the pen-holding stopper, of a longitudinal groove in the inner or upper end of the pen-holding stopper, substantially as and for the purposes set forth.

5. In a fountain-pen, the combination, with a pen-holding stopper, a transverse slot for holding the pen extending through the pen-holding stopper, and a transverse groove in the inner or upper end of the pen-holding stopper, of a pen whose shank fits into the transverse slot for holding the pen and extends beyond it into the inner or upper portion of the pen-holding stopper, substantially as set forth.

6. In a fountain-pen, the combination, with a pen-holding stopper, a transverse slot for holding the pen extending through the pen-holding stopper, and a longitudinal groove in the inner or upper end of the pen-holding stopper, of a pen whose shank fits into the transverse slot for holding the pen and extends beyond it into the inner or upper portion of the pen-holding stopper, substantially as set forth.

7. In a fountain-pen, the combination, with a pen-holding stopper, a transverse slot for holding the pen extending through the pen-holding stopper, and projections in the inner or upper end of the pen-holding stopper touching the pen-shank at the corners thereof and at the back thereof, of a pen whose shank fits into the transverse slot for holding the pen and extends beyond it and is firmly held between projections in the inner or upper end of the pen-holding stopper, substantially as set forth.

8. In a fountain-pen, the combination, with a pen-holding stopper, a transverse slot for holding the pen extending through the pen-holding stopper, projections in the inner or upper end of the pen-holding stopper, and a pen whose shank extends through the transverse slot into the inner or upper portion of the pen-

holding stopper where it is held between said projections, of a feed-tongue back of the pen, substantially as and for the purpose set forth.

9. In a fountain-pen, the combination, with a pen-holding stopper and a longitudinal groove in the inner or upper end of the pen-holding stopper, of an ink-duct extending through the pen-holding stopper from the lower end thereof to the longitudinal groove, substantially as and for the purpose set forth.

10. In a fountain-pen, the combination, with a pen-holding stopper and a longitudinal groove in the inner or upper end of the pen-holding stopper, of an air-aperture extending through the pen-holding stopper from the lower end thereof to the longitudinal groove, substantially as and for the purpose set forth.

11. In a fountain-pen, the combination, with a pen-holding stopper, a transverse slot for holding the pen extending through the pen-holding stopper, and a pen whose shank fits into the transverse slot for holding the pen and extends beyond said slot into the inner or upper portion of the pen-holding stopper, of projections in the inner or upper end of the pen-holding stopper back of the pen-shank bearing upon the back of the pen-shank, substantially as and for the purpose set forth.

12. In a fountain-pen, the combination, with a pen-holding stopper, a transverse slot for holding the pen extending through the pen-holding stopper, a transverse groove constructed across the inner or upper end of the pen-holding stopper, and a pen whose shank extends through the transverse slot into the transverse groove, of a feed-tongue back of the pen, substantially as and for the purpose set forth.

13. In a fountain-pen, the combination, with a pen-holding stopper and a feed-bar, of a groove in the inner or upper end of the pen-holding stopper below the pen-shank affording a firm bearing for the feed-bar, sustantially as described.

14. In a fountain-pen, the combination, with an ink-holder and a pen-holding stopper, of a feed-bar attached to the pen-holding stopper and held against the inner walls of the ink-holder on the side below the pen in such a manner as to form an ink-channel between it and the inner wall of the ink-holder extending from the upper portion of the ink-holder down to the pen-holding stopper, substantially as set forth.

15. In a fountain-pen, the combination, with a feed-bar, of a spring attached to the feed-bar, substantially as and for the purposes set forth.

16. In a fountain-pen, the combination, with a pen-holding stopper and a beveled recess in the same for the reception of the pen, of a pen having beveled shoulders fitting into said beveled recess, substantially as set forth.

17. In a fountain-pen, the combination, with a pen-holding stopper and a transverse slot for holding the pen extending through the pen-holding stopper, of a pen whose shank extends through the transverse slot into the inner or upper portion of the pen-holding stopper and is provided with a longitudinal slot in said shank, substantially as and for the purpose set forth.

18. In a fountain-pen, the combination, with a pen-holding stopper, a transverse slot for holding the pen extending through the pen-holding stopper, and a pen whose shank fits into said transverse slot and extends beyond said transverse slot and beyond the longitudinal slot, of a longitudinal slot at right angles with the pen, substantially as set forth.

19. In a fountain-pen, the combination, with a pen-holding stopper, a transverse slot for holding the pen extending through the pen-holding stopper, and a pen whose shank fits into said transverse slot and extends beyond it and beyond the ink-duct into the inner or upper portion of the pen-holding stopper, of an ink-duct extending through the pen-holding stopper, substantially as and for the purpose set forth.

20. In a fountain-pen, the combination, with a pen-holding stopper, a transverse slot for holding the pen extending through the pen-holding stopper, and a pen whose shank fits into said transverse slot and extends beyond it and beyond the air-aperture into the inner or upper portion of the pen-holding stopper, of an air-aperture extending through the pen-holding stopper situated back of the pen-shank, substantially as and for the purpose set forth.

21. In a fountain-pen, the combination, with a pen-holding stopper, a transverse slot for holding the pen extending through the pen-holding stopper, and a pen whose shank fits into the transverse slot for holding the pen and extends beyond said slot into the inner or upper portion of the pen-holding stopper, of projections in the inner or upper end of the pen-holding stopper adjacent to the corners of the pen-shank and extending above the inner or upper end of the transverse slot for holding the pen, substantially as and for the purposes set forth.

22. In a fountain-pen, the combination, with an ink-holder and pen-holding stopper, of an ink-channel around the pen-holding stopper between it and the ink-holder, substantially as and for the purpose set forth.

23. In a fountain-pen, the combination, with a pen-holding stopper, a transverse slot for holding the pen extending through the pen-holding stopper, and a pen whose shank fits into said transverse slot and extends beyond it into the inner or upper portion of the pen-holding stopper, of a feed-tongue back of the pen, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

LUCIEN B. WOOLFOLK.

Witnesses:
G. A. CLARK,
R. J. BEALL, Jr.