May 30, 1950 R. T. WING 2,509,465

DUAL-WELL FOUNTAIN PEN

Filed March 18, 1946 3 Sheets-Sheet 1

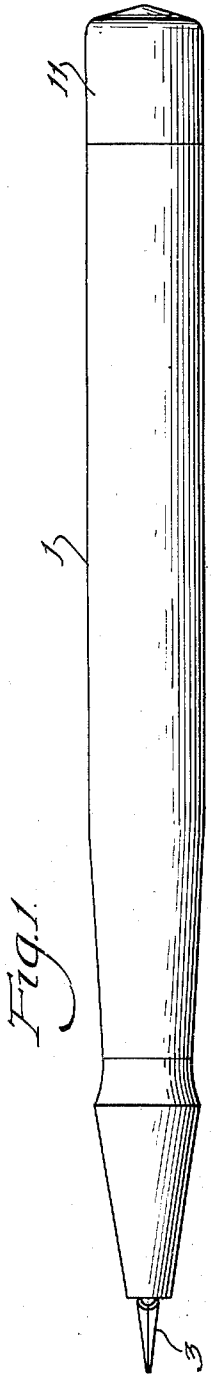

Fig. 1.

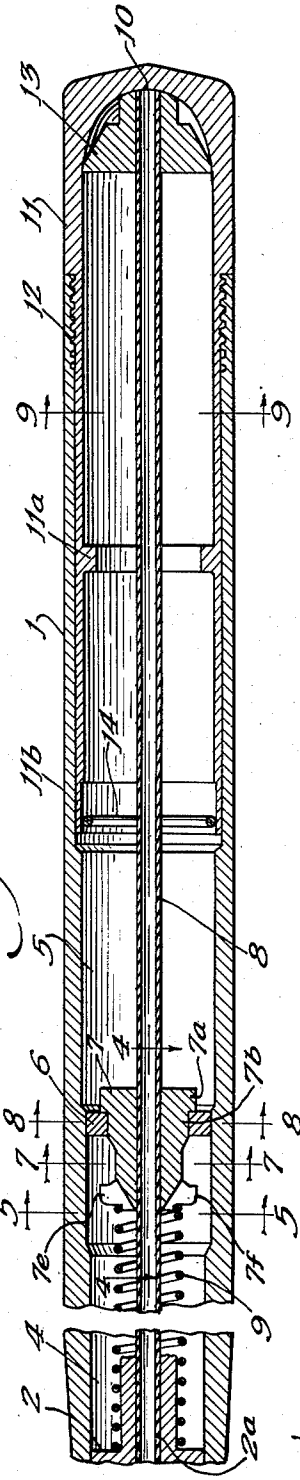

Fig. 2.

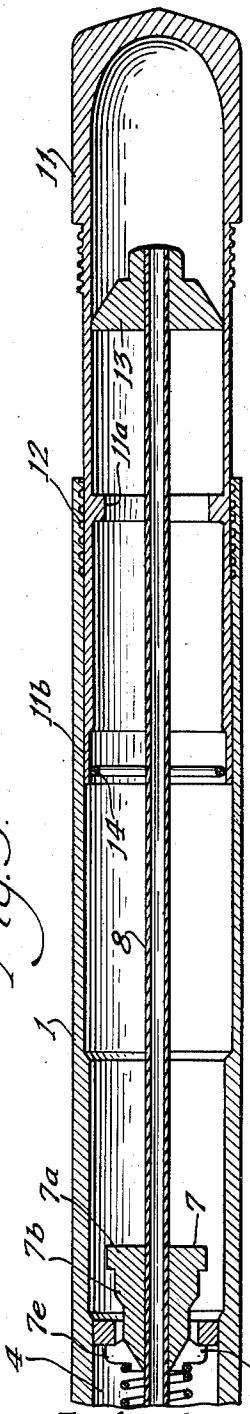

Fig. 3.

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DUAL-WELL FOUNTAIN PEN

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Fig. 4.

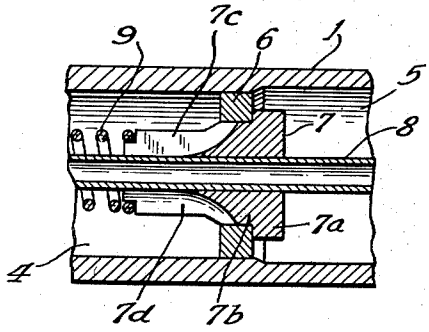


Fig. 5.

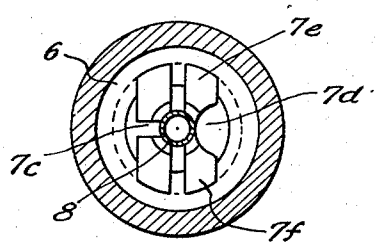


Fig. 6.

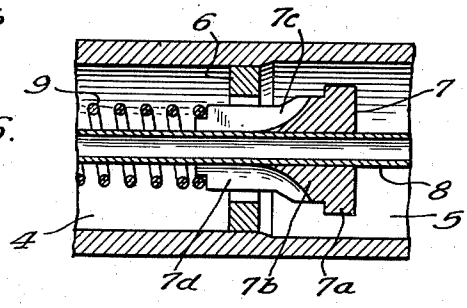


Fig. 7.

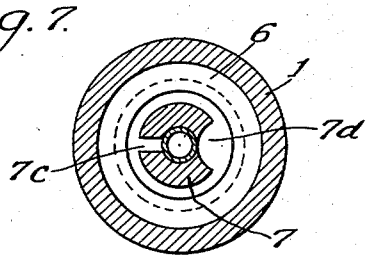


Fig. 8.

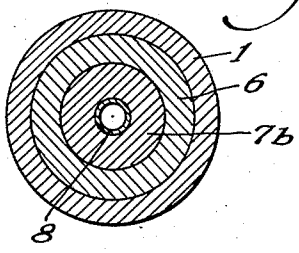
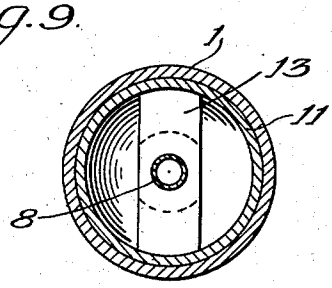


Fig. 9.



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DUAL-WELL FOUNTAIN PEN

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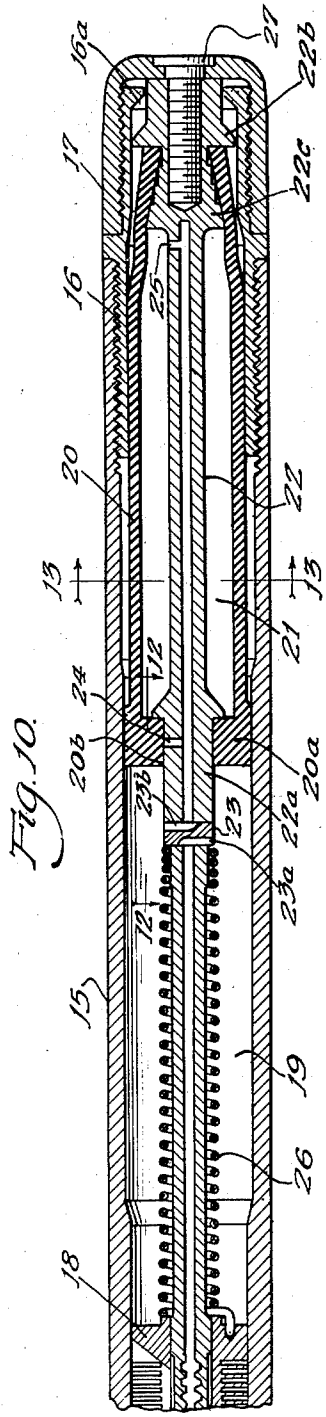

Fig. 10.

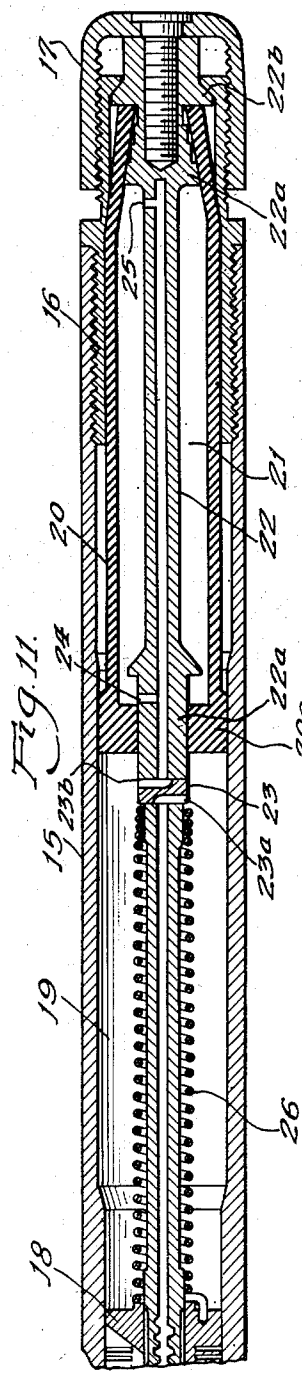

Fig. 11.

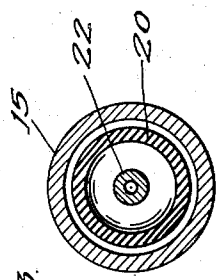

Fig. 13.

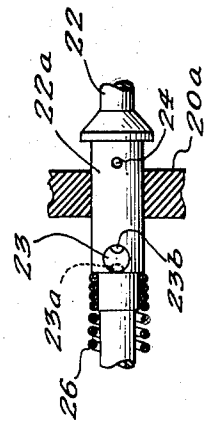

Fig. 12.

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Patented May 30, 1950 2,509,465

UNITED STATES PATENT OFFICE

2,509,465

DUAL-WELL FOUNTAIN PEN

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Application March 18, 1946, Serial No. 655,077

5 Claims. (Cl. 120—42.16)

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This invention relates to fountain pens and has for its primary object to make it possible to provide a relatively large ink storage capacity without increasing the hazard of ink leakage; or, better still, decreasing that hazard.

In a conventional fountain pen the practical maximum capacity of the ink reservoir is objectionably restricted by the fact that increments of temperature within the reservoir, such as are commonly brought about by holding the pen barrel in one's warm hand, will cause the reservoir pressure to rise; and, if the volume of air within a reservoir thus affected is more than a certain amount which experience has shown to be a permissible maximum, the resultant expansion will force out of the reservoir more ink than the feed element can accommodate—with the result that excessive ink will be discharged from the nib. That is what I refer to as flooding or bleeding, and it is something which is most likely to happen when the reservoir is nearly empty, because when that condition obtains there is a relatively large volume of air in the reservoir.

A similar result is apt to occur when a conventional fountain pen is taken, within a short space of time, from a lower to a much higher altitude, as often happens when flying; although in that event it is not a change of temperature which causes the pen to flood. Rather, it the differential between inside and outside pressure, due to the lowering of the outside pressure without a concomitant and equal lowering of the internal pressure. In either case, the size of the reservoir is a critical factor because, as will be apparent, the larger the volume of air in the reservoir the greater must be the volumetric expansion to bring about pressure equilibrium.

The present invention entails the provision of what I call a dual reservoir construction—wherein one reservoir alone is normally connected to the ink feed means whereas a second reservoir is normally isolated from the first, as respects transference of ink, but may be connected thereto, at will, for the purpose of replenishing the supply of ink in the first reservoir.

What I call the first reservoir is, preferably, of small enough capacity to avoid the probability of flooding from either of the aforementioned causes, while the second reservoir may be as large as the predetermined over-all dimensions of the barrel will permit. That is to say, the size of the second reservoir may be as large as desired, within the limitations imposed by the maximum allowable over-all size of the barrel.

Another object of my invention is to provide a

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convenient and effective filler means, which is effective to fill both reservoirs, and which is adaptable to the necessity of being able to open and close a valve between the two reservoirs.

A further object is to provide a suitable valve between the first and second reservoirs together with convenient means for opening and closing said valve, which will not in any way complicate or interefere with the functioning of the pen or of the filler means and which will not be detrimental to the appearance of the pen.

Still another object is to provide a dual-reservoir pen which can be manufactured economically—the parts being of straightforward design and susceptible of quick and easy assembling and disassembling.

My invention not only makes practicable a greatly increased ink capacity, but it also serves, inherently, as a reminder to refill long before the pen goes dry—thus helping to forestall that contingency.

In the drawings which accompany this specification:

Figure 1 is an elevational view of a fountain pen embodying my invention according to one of the preferred forms;

Fig. 2 is an enlarged longitudinal sectional view of a portion of the pen shown in Fig. 1, showing the parts pertaining to this invention in their normal positions;

Fig. 3 is an enlarged longitudinal sectional view similar to Fig. 2, but showing the dual well valve open and the ink pump piston partially withdrawn from the pen barrel;

Fig. 4 is a fragmentary longitudinal sectional view taken along line 4—4 of Fig. 2;

Fig. 5 is a transverse sectional view taken along line 5—5 of Fig. 2;

Fig. 6 is a fragmentary longitudinal sectional view similar to Fig. 4 but showing the dual well valve open;

Fig. 7 is a transverse sectional view taken along line 7—7 of Fig. 2;

Fig. 8 is a transverse sectional view taken along line 8—8 of Fig. 2;

Fig. 9 is a transverse sectional view taken along line 9—9 of Fig. 2;

Fig. 10 is a longitudinal sectional view of the rear portion of another fountain pen illustrating a second embodiment of the invention—the internal parts being shown in their normal positions;

Fig. 11 is a longitudinal sectional view similar to Fig. 10 but showing the internal parts in the

positions they assume in effecting an interconnection between the two reservoirs;

Fig. 12 is a fragmentary view taken along line 12—12 of Fig. 10; and

Fig. 13 is a transverse sectional view taken along line 12—12 of Fig. 10.

Referring first to Figs.1 to 9 inclusive, the pen structure therein illustrated comprises an elongate barrel 1 within the forward end of which is a feed element 2 (see Fig. 2) in which is secured a writing nib 3 which, in Fig. 1, is shown projecting from the front end of the barrel. The feed element preferably includes an overflow governor of the type described in my U. S. Patent No. 2,187,528; but so far as the present invention is concerned the type of feed element employed is immaterial.

Within the barrel 1 and immediately to the rear of feed element 2 is an ink-holding chamber 4, which I designate as the first reservoir. This reservoir is continuously connected, through the feed element, with the nib 3, in accordance with conventional practice, and ink is supplied to the nib therefrom. The size of the first reservoir is preferably such as to minimize the possibility of flooding from causes previously mentioned. That is to say, the first reservoir is preferably of rather small capacity; but it may be as large as is customarily employed in conventional fountain pens designed with a view to avoidance of flooding.

Situated to the rear of the first reservoir is a second reservoir 5 which may have as large an ink capacity as the over-all dimensions of the barrel will permit. This second reservoir is normally isolated from the first reservoir by a wall comprising a ring 6 constituting a seat for a valve 7 which is normally closed. With said valve closed there is no connection between second reservoir 5 and nib 3 and any pressure which may develop within the second reservoir is ineffective to discharge the ink therefrom. When valve 7 is opened, ink will flow from the second reservoir 5 into the first reservoir 4 and refill the same.

Valve 7 has a flange 7*a* which seats against the face of ring 6, and also has a shank 7*b* which fits slidably in the bore of said ring. Because the second reservoir has no vent to atmosphere it is very desirable to provide in the shank 7*b* two lengthwise extending grooves 7*c* and 7*d*, respectively (Fig. 4). Groove 7*c* is of capillary width. That is to say, it is so narrow that ink will flow therethrough by capillary action when the valve is open. Groove 7*d*, on the contrary, is of non-capillary dimensions. When the valve is open and the pen point is down, air will pass from the first reservoir via groove 7*d* into the second reservoir while ink flows from the second reservoir into the first reservoir via groove 7*c*. Ink will also flow through groove 7*d* when the pressure in the two reservoirs is sufficiently equalized. Without the capillary groove 7*c* or some equivalent arrangement a condition of balance could obtain which would prevent or materially delay tranference of ink from the second to the first reservoir unless suitable provision were made for venting the second reservoir.

Valve 7 is carried by and secured to an elongate tube 8 which functions not only as a supporting means for opening and closing said valve but also as a breather tube or fill stem and as a means for actuating a cleaner tongue and nib adjusting mechanism (not shown).

Tube 8 is slidably telescoped in a bore 2*a* in the feed means 2 and is, therefore, movable lengthwise together with the valve 7. A helical

spring 9 bearing at one end against feed element 2 and at the other end against valve 7 continuously urges said valve toward the open position thereof in which it is shown in Figs. 3 and 6. But valve 7 is normally held closed, as shown in Figs. 2 and 4 because the rear end of tube 8 abuts at 10 the inside end surface of a cup-shaped piston 11 which is threaded at 12 into the barrel 1. By unscrewing piston 11 and withdrawing it a little way, as shown in Fig. 3, tube 8 and valve 7 are enabled to move rearwardly until a pair of ears 7*e* and 7*f*, forming integral parts of the valve, strike ring 6, whereupon the rearward movement of the valve is arrested. When thus positioned, the valve is open and ink will flow from the second reservoir 5 into the first reservoir 4, provided the pen is held point down. Thereafter, when the first reservoir has been refilled, the piston is returned to its normal position and the valve thereby closed.

Filling of the pen is accomplished by unscrewing piston 11 and reciprocating it while the front end of the pen is immersed in an ink bottle. Tube 8 then operates as a so-called breather tube or fill stem—air being discharged therethrough on each downstroke of the piston.

Ring 6 preferably is made of a resilient plastic such as "neoprene" and is pressed into place and can be withdrawn from the barrel along with tube 8 and valve 7. In order to enable doing this conveniently and at the same time to limit the outward stroke of piston 11 during filling operations, there is formed on the piston an inwardly projecting flange 11*a* which is adapted to engage a knob 13 secured to the rear end of tube 8 and indicate that the piston has reached the rearward limit of its filling stroke. If however a considerable rearwardly directed force is applied to piston 11, the flange 11*a* bearing on the knob 13 will cause the ring 6 to be dislodged and the entire sub-assembly including tube 8 and valve 7 can be withdrawn from the barrel. Piston 11 is preferably made of a resilient plastic which, when it is withdrawn from barrel 1, can be compressed laterally to permit passage of knob 13 through the opening in flange 11*a*. As shown in Fig. 9, knob 13 is quite narrow in one direction. An expansion ring 14 serves to press the skirt of piston 11 into firm engagement with the bore of barrel 1; and the outer surface of said skirt is preferably thinly coated at 11*b* with a rubber-like substance adapted to effect a good seal.

The structure of Figs. 10 to 12 comprises a barrel 15 into which is threaded, at the rear end, a screw bushing 16, onto which, in turn, is threaded a cap 17. A feed element 18 is mounted in the forward end of the barrel and is provided with a suitable ink feed channel through which ink is fed to the nib (not shown) from the first reservoir 19.

Disposed rearwardly of the first reservoir 19 is a collapsible rubber sac 20, the interior 21 of which constitutes the second reservoir. The forward end 20*a* of sac 20 constitutes a dividing wall between the first and second reservoirs and has an axial bore 20*b* in which is slidably journaled a portion 22*a* of an elongate tube 22. The normal position of tube 22 is that shown in Fig. 10, from which it will be evident that ink normally cannot flow from reservoir 21 into reservoir 19 when the point of the pen is held down, although it can flow from reservoir 19 into reservoir 21 when the pen is held point up. This pen, however, is designed to be carried point down.

Extending transversely through tube 22 is a plug 23 having channels 23*a* and 23*b* cut therein. Channel 23*a* connects the forward portion of the bore of tube 22 with reservoir 19 while channel 23*b* connects the rear portion of the bore of tube 22 with reservoir 19. A lateral aperture 24 is normally obstructed by the wall 20*a*, as depicted in Fig. 10, but opens into reservoir 21 when tube 22 is moved rearwardly as in Fig. 11. Another aperture 25 connects the rear end of the bore of tube 22 to the rear end of reservoir 21.

Tube 22 is continuously urged rearwardly by a helical spring 26; but said tube is normally held in the position shown in Fig. 10 by the cap 17.

The rear end of sac 20 is fixedly anchored to an enlargement 22*c* of tube 22 and, by reason of said anchorage is capable of being stretched by the backward movement of the tube. Said sac is cemented to the barrel at its forward end so that wall 20*a* remains in a fixed position.

Enlargement 22*c* has an external tapered flange 22*b*, the inclined face of which is designed to engage a correspondingly inclined complementary face 16*a* formed on bushing 16, when tube 22 is moved sufficiently to the rear as depicted in Fig. 11. Cap 17 is drilled and counterbored to receive the head of a pivot screw 27 which is threaded into the rear end of enlargement 22*c*. Cap 17 is freely rotatable on the head of screw 27.

Upon partially unscrewing cap 17 from bushing 16, tube 22 moves rearwardly under the impetus of spring 26, whereupon the inclined face of flange 22*b* engages the inclined face 16*a* and the frictional adhesion therebetween presently becomes of such magnitude that the twisting force applied to cap 17 causes bushing 16 to become partially unscrewed from barrel 15. Tube 22 then rotates with cap 17 and bushing 16 and, as a result, sac 20 is twisted and consequently collapsed so as to reduce its internal capacity. By rotating cap 17 first one way and then the other, sac 20 can be alternately collapsed and expanded in such manner that it is effective as a pen filling means. By collapsing sac 20, air is driven therefrom through apertures 24 and 25 into the rear bore of tube 22, thence through channel 23*b* into reservoir 19 from which it passes through channel 23*a* into the front bore of tube 22 and out through the feed element 18. Then, upon allowing sac 20 to expand, and assuming that the front end of the pen is immersed in an ink supply, ink is drawn in through the bore of 23*a* into reservoir 19. In this manner reservoir 19 is filled up to the level of plug 23 and, thereafter, one more expansion of sac 20 will fill or partly fill said sac. The ink which is thus drawn into the sac constitutes a reserve supply. After thus filling the pen, cap 17 and bushing 16 are screwed back to their normal position as per Fig. 10.

Since the pen is carried point down, any pressure developed in reservoir 21 will not expel ink therefrom through aperture 25; but if cap 17 is unscrewed, as depicted in Fig. 11, so as to shift aperture 24 to a position within reservoir 21, ink can flow into the rear bore of tube 22 and thence through channel 23*b* into reservoir 19. And by further unscrewing cap 17 so as to twist and collapse sac 20 the ink will be forced out of reservoir 21.

Were it not for the fact that tube 22 performs an additional function having nothing to do with the present invention, said tube could be made in two separate parts and plug 23 could be eliminated. So far as the present invention

is concerned, there is no need for that part of tube 22 which is situated in reservoir 19 to be movable. Therefore, the two parts of tube 22 disposed forwardly and rearwardly of plug 23 can be considered as distinct entities which can be separate and distinct parts if only the subject invention is involved and the aforementioned additional function eliminated. In drafting certain of the appended claims I have regarded tube 22 as two tubes, without specifying any physical coupling therebetween.

I claim:

1. In a fountain pen, a barrel, a nib at the front end of said barrel, a first reservoir within said barrel, feed means connecting said first reservoir with said nib, a second reservoir within said barrel at the rear of said first reservoir, a fill stem connected to said feed means and extending axially of said barrel through both said reservoirs and movable lengthwise thereof, a valve providing the sole connection between said reservoirs for the transference of ink therebetween, said valve being normally closed and operatively mounted on said fill stem, a spring biasing said valve toward open position, a pump piston in sliding telescopic connection with the rear portion of said barrel, means normally operative to hold said piston in its forwardmost position, and a connection between said fill stem and said piston whereby said valve is normally held closed by said piston against the action of said spring.

2. In a fountain pen, a barrel, a nib at the front end of said barrel, a first reservoir at the front end of said barrel, feed means connecting said first reservoir with said nib, a second reservoir within said barrel at the rear of said first reservoir, a valve providing the sole connection between said reservoirs for the transference of ink therebetween, a fill stem connected to said feed means and extending axially of said barrel through both said reservoirs and movable lengthwise thereof, said valve including an element which is carried by said fill stem and movable therewith for opening and closing the valve, a spring urging said fill stem and valve element rearwardly toward a position wherein the valve is open, a pump piston in said second reservoir and reciprocable lengthwise thereof, means normally holding said piston in its forwardmost position, said fill stem being normally held by said piston in its forwardmost position, thus holding said valve closed, said piston being reciprocable to a limited extent independently of said fill stem for filling said reservoirs.

3. In a fountain pen, a barrel, a nib at the front end of said barrel, a first reservoir within said barrel, feed means connecting said first reservoir with said nib, a second reservoir within said barrel at the rear of said first reservoir, valve means providing the sole connection between said reservoirs for the transference of ink therebetween, said valve being normally closed, there being no communication between said second reservoir and said feed means and nib except when said valve is open, said valve having a capillary passageway and a non-capillary vent passageway, each interconnecting said reservoirs only when said valve is open, said capillary passageway providing a conduit for the flow of ink from the second reservoir to the first reservoir, and said vent passageway providing a conduit for the escape of air from said first reservoir into said second reservoir, and manually operable means for opening and closing said valve.

4. In a fountain pen, a barrel, a nib at the front end of said barrel, a first reservoir within said barrel, feed means connecting said first reservoir with said nib, a second reservoir within said barrel at the rear of said first reservoir, a valve providing the sole connection between said reservoirs for the transference of ink therebetween, said valve including an annular stationary seat and a movable valve element having a seat portion normally engaging said stationary seat and thus maintaining the valve normally closed, said valve element including a shank portion extending through and slidably fitting the bore of said annular stationary seat, said shank portion having a capillary groove and a non-capillary groove, said capillary groove providing a conduit, when the valve is open, for the flow of ink from the second reservoir to the first reservoir, said non-capillary groove providing a conduit, when the valve is open, for discharging air from the first reservoir into the second reservoir, and manually operable means for opening and closing said valve.

5. In a fountain pen, an elongate barrel, an annular valve seat member removably secured in said barrel and serving to divide the space within said barrel into two compartments comprising a first reservoir located at the front end of the barrel and a second reservoir located at the rear of the first reservoir, a cup-like pump piston slidably telescoped into the rear end of said barrel, said piston being normally held in its forwardmost position by threaded engagement with said barrel, said piston being releasable for reciprocation by unscrewing it from the barrel, and an assembly removably mounted in said barrel and comprising a governor including ink feed means, a fill stem telescopically connected to said governor and extending axially through said barrel, a valve element carried by said fill stem and extending through said annular valve seat, said valve element normally cooperating with said valve seat member to segregate said reservoirs, a spring continuously urging said fill stem and valve element rearwardly, the rear end of said fill stem normally bearing against said piston and being thus held in a position which maintains said valve element in seating engagement with said valve seat member, said fill stem and valve element being movable rearwardly by said spring when said piston is unscrewed from said barrel.

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