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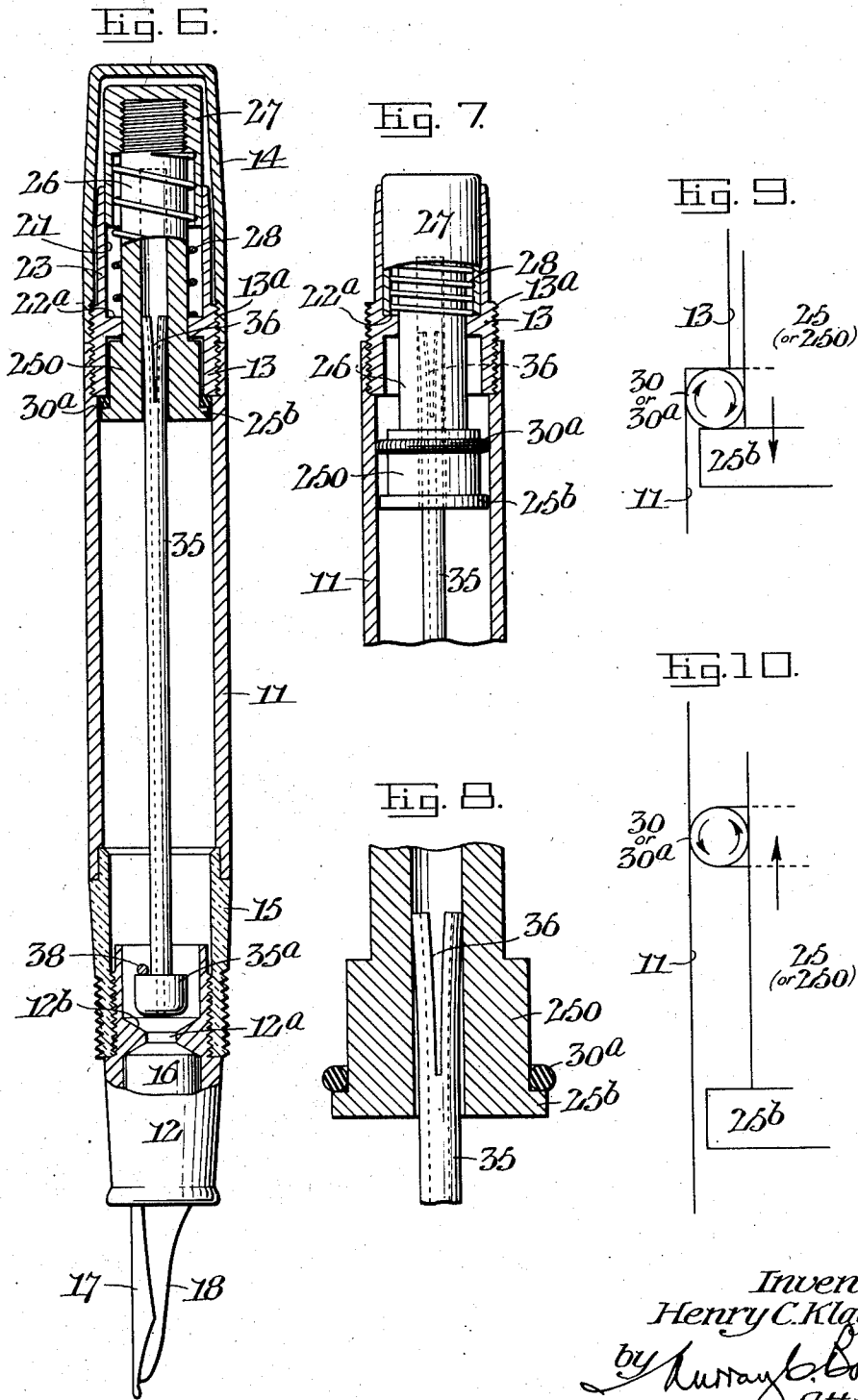
H. C. KLAGGES

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FOUNTAIN PEN

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Inventor,  
Henry C. Klagges  
by Murray C. Boyer  
Attorney

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## FOUNTAIN PEN

Henry C. Klagges, Collingswood, N. J., assignor  
to The Esterbrook Steel Pen Manufacturing  
Co., Camden, N. J., a corporation of New Jersey

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My invention relates to fountain pens and comprises a form of filling device involving a piston or plunger movably mounted with respect to the barrel which constitutes the ink reservoir of the pen, and air-releasing means associated with such piston or plunger so that upon operating the filling device, such rarefaction of air will occur within the barrel or reservoir as to create a partial vacuum as the plunger is actuated, whereby ink may subsequently enter and substantially fill such barrel.

One object of my invention is to provide a filling device of simple and economic construction which may be easily made and readily and efficiently operated.

A further object of my invention is to provide a form of filling device which may be inserted and removed as a unit from the barrel of the pen.

A further object of my invention is to provide an improved form of plunger or piston with a relatively small washer or gasket which fills the space between the piston and the wall of the barrel; the piston head being of such dimensions with respect to said washer or gasket that the latter may roll on the piston head as it is moved in either direction during a filling operation.

A further object of my invention is to provide a tubular fitting in threaded engagement with the end of the pen barrel; such fitting carrying the plunger mechanism and enabling the latter, with the fitting, to be removed from the pen barrel or inserted as a unit.

A further object of my invention is to provide means for sealing the bore of the fitting mounted in the end of the pen barrel and receiving the plunger, to insure against leakage past the plunger stem.

A further object of my invention is to utilize the washer or gasket of the piston as the sealing means for the plunger or piston stem.

A further object of my invention is to associate an improved form of air tube with the filling mechanism, and to arrange that such air tube shall have limited movement effected by the plunger device when the latter is moved in both directions.

A further object of my invention is to provide means whereby the air tube may seat against the pen section when the plunger mechanism is depressed so that air may be more readily discharged from the air tube through the pen section.

And a still further object of my invention is to provide a means to prevent accidental displacement of the air tube.

The plunger or piston of my improved filling device is flanged, and may be provided with flanges at top and bottom of the same or at one end only. Upon the outside of this plunger and above the lower flange I mount a suitable gasket or washer, which is relatively small in size and of small cross-sectional dimension; such gasket or washer being capable of movement on the plunger by reason of its frictional engagement therewith and with the inner wall of the barrel during the pumping strokes of such plunger. The gasket or washer is slightly stretched when set in place and its cross-sectional contour may be oval, circular, square, or of other polygonal form.

In all forms of plunger-actuated filling devices wherein filling is effected by a pumping action, provision must be made for removal of the air on the downstroke and for this purpose I provide an air tube which may be said to float between the plunger, which is hollow, and the pen section, which latter element has a bore provided with a seat for engagement by an enlarged portion at the end of said air tube; the arrangement being such that the air tube will be forced to such seat when the plunger is depressed through operative engagement of said plunger with the upper end of said air tube; the air finding its way out through the passages of the feed bar mounted in the pen section or otherwise.

The plunger is mounted in a removable tubular fitting at the end of the barrel and is surrounded by a coiled spring so that it may be automatically returned after a pressure stroke has been completed. By preference a cap is mounted on the outer end of the plunger and is engaged by the upper end of the spring.

These and other features of my invention are more fully set forth hereinafter; reference being had to the accompanying drawings, more or less diagrammatic in character, in which:

Figure 1 is a longitudinal sectional view of a fountain pen constructed in accordance with my invention and equipped with improved filling means within the scope of my invention; such view showing the several parts of the structure in the position they occupy when the pen is ready for writing purposes and indication of ink is omitted for clarity of illustration.

Fig. 2 is a sectional view, similar to Fig. 1, showing the plunger or piston element of the filling means at the end of an inward stroke.

Fig. 3 is a fragmentary view of a portion of the structure illustrated in Figs. 1 and 2, partly in section; showing the piston or plunger near the end of a return stroke.

Figs. 4 and 5 are cross-sectional views on the lines IV—IV and V—V, Fig. 1.

Fig. 6 is a view similar to Fig. 1, illustrating a slightly modified form of construction within the scope of my invention.

Fig. 7 is a fragmentary sectional view of a part of the structure illustrated in Fig. 6; showing the piston or plunger at the end of an inward or downward stroke.

Fig. 8 is a fragmentary sectional view illustrating a detail of the piston head and the air tube associated with plunger mechanism of the type shown in Fig. 6, and

Figs. 9 and 10 are diagrammatic views illustrating the action of the rolling washer or gasket during the movement of the piston or plunger.

In the drawings, a fountain pen barrel is indicated at 11, carrying at one end a pen section 12, and at the opposite end a tubular fitting 13, which may be in threaded engagement with the end of the barrel. When threaded, such fitting may have portions of its threads, 13<sup>a</sup>, extending beyond the barrel for the reception of a closure cap 14. In lieu of a threaded fitting, I may employ one having frictional engagement with the pen barrel and the exposed portion receiving the closure cap may be threaded for engagement therewith, or the latter may frictionally engage the fitting.

By preference, a transparent section 15, which may be frictionally or otherwise secured to the pen barrel proper, is interposed between the latter and the pen section. In the present instance, the pen section is shown in threaded engagement with the transparent section, but any other form of connection, including a slip joint, may be employed if desired. The pen section is shown as carrying a unit insert which includes a shell 16, in threaded engagement with the pen section adjacent its outer end, and a pen point 17 and feed bar 18, permanently mounted in such shell 16. The end of the shell 16 seats against the inner end of the pen section socket, which is centrally bored at 12<sup>a</sup> for communication with the pen barrel. It will be understood of course that the pen section may carry any form of pen point and/or feed bar in lieu of the unit insert illustrated.

The tubular fitting 13 at the opposite end of the pen barrel has an enlarged bore, preferably of two diameters, as indicated at 20 and 21, to provide a shoulder 22, and the portion extending beyond the end of the pen barrel may include an upstanding flange or apron 23 providing space for the plunger; the upper end of these parts being enclosed by the cap 14, which is detachably secured to the tubular fitting 13.

Within the pen barrel a piston head 25 is mounted, and in the form of structure shown in Figs. 1, 2 and 3, its body is annularly recessed to provide flanges 25<sup>a</sup> and 25<sup>b</sup> in spaced relation at opposite ends thereof; such flanges being of slightly less diameter than the internal diameter of the pen barrel so as to have a relatively loose fit therein. The piston head 25 may be integral with and carried by a stem 26 relatively fitting the smaller bore 20 of the fitting 13, and such stem carries a cap 27 with a depending flange lying within the bore 21 formed by the flange or apron 23 of the tubular fitting 13, between which and the shoulder 22 of such fitting, a coiled spring 28 is interposed for the purpose of restoring the plunger to normal position after inward or downward strokes thereof to ex-

pel a portion of the air within the pen barrel preliminary to the inflow of ink.

In order that a proper air and liquid tight joint may be made between the inner wall of the barrel and said piston or plunger during pumping movements of the latter, I mount upon the reduced portion of the piston head a gasket or washer 30, of such size as to require slight stretch when placed upon said piston head and of such bulk or volume as to fill, transversely, the space between such reduced portion of the piston head and the inner wall of the pen barrel. This gasket or washer is relatively small in its cross-sectional dimension so that during the pumping operations of the plunger, it has movement and relatively to said piston head—that is to say—it occupies the position indicated in Fig. 1 when the pen is in condition of use, but when the plunger is depressed in a pumping action to dispel the air and create such rarefaction within the pen barrel as to induce inflow of ink, its position with respect to such piston head will be near or adjacent to the upper end of its reduced portion, as indicated in Fig. 2.

The frictional engagement between the surface of the piston head and the inner wall of the barrel is such that such washer or gasket will actually roll on the piston head during movement of the latter in both directions. This rolling motion insures perfect closure between the piston head and the inner wall of the barrel, which can be assumed to be truly circular or substantially so.

In order to definitely insure against leakage of ink past the plunger, I preferably mount upon the plunger stem an elastic gasket or washer 31, which lies on top of the piston-head and tightly engages the under side of the lower part of the tubular fitting 13 when the parts are in the position shown in Fig. 1.

The piston-head and its stem, which is slidably mounted in the bore of the threaded sleeve or tubular fitting at the head of the barrel, is hollow and receives the upper end of an air tube 35. This upper end may be slotted at 36 so that the portion opposite the slots may be outwardly flared to an extent sufficient to effect frictional engagement with the interior of the hollow piston and said tube whereby, upon depression of the plunger and piston, the air tube will be lowered promptly to its seat and after reaching the limit of its downward movement, the hollow stem of the plunger and the piston may slide over the same. In addition to the slots 36, the air tube shown in Fig 1, may be cross-bored, as indicated at 37.

The lower end of the air tube has an enlarged boss or head 35<sup>a</sup> adapted to a seat 12<sup>b</sup> surrounding the bore 12<sup>a</sup> of the pen section 12, and when such tube is lowered upon depressing the plunger, such enlarged portion will engage the seat and air entering said tube from the barrel will pass directly to the outside through passages in the feed bar mounted in the pen section prior to entrance of ink to take the place of such air. When the plunger rises under the action of the spring, after a depression, the air tube will be lifted from its seat but will not be raised from the pen section by reason of a stop which may be in the form of a cross-pin 38 carried by the pen section.

While I prefer to use what may be termed a floating air-tube, as illustrated, it is within the scope of my invention to employ an air-tube supported by the plunger in such manner that it may be positively moved up and down by the plunger, with provision for movement of the

plunger with respect to such tube after the latter has reached its seat, which arrangement may include the use of a spring within the hollow plunger above the end of the air tube, or otherwise associated.

In the form of structure shown in Figs. 1, 2, 3, et seq., I have indicated a piston or plunger having flanges at both ends, with the washer or gasket 30 disposed for movement between the

upper end of the air tube is slit and the separate ends are outwardly flared to provide the desired frictional contact with the bore so that movement may be imparted to the air tube. In this instance the bore of the plunger is slightly larger than the air tube; the space between the tube and plunger bore being sufficient for the passage of air to the slotted portion and thence to the bore of the tube for discharge when the plunger is actuated.

The gasket or washer 30, or 30<sup>a</sup>, may be of 10 rubber or of any rubbery composition, or of any material that will provide the desired resilience, flexibility and/or elasticity that will permit it to function to seal the piston or plunger in the barrel during its movements, and to roll with respect to the piston; it being understood that the material so employed will be one that will not be affected by the inks employed in fountain pens.

The parts of the filling device may be of metal, or of composition of any suitable character, in whole or in part, and in all instances of a character unaffected by any type of ink employed in fountain pens.

It will be understood that modifications may be made in the embodiments of my invention illustrated and described, without departing therefrom, all of which is believed to be covered by the appended claims.

#### Operation

In the operation of my improved fountain pen filling device, the parts are normally in the position illustrated in Fig. 1, (or Fig. 6); the movable washer carried by the plunger or piston-head occupying a position adjacent the lower flange of such plunger, and the air tube being in the raised position; a condition due to the fact that, by reason of the frictional engagement of its upper slitted end with the bore of the plunger, it will rise with the plunger until halted by the stop carried by the pen section.

The upper end of the plunger which may terminate in a flanged cap slidable in the tubular fitting, is maintained in the elevated position by a spring and when such plunger is depressed against the tension of the spring by movement imparted to the cap, it is lowered in the barrel. In the first part of such movement, the boss or enlargement at the lower end of the air tube will close the passage of the pen section, and a portion of the air within the barrel will find its exit through the slitted portion of the air tube which remains uncovered during the depression of the plunger. As the plunger continues its movement, the washer or gasket will be rolled, so to speak, on the surface of the piston head by its engagement with the inner wall of the pen barrel, as indicated by the diagrams illustrated in Figs. 9 and 10, and at the end of such movement it will lie near the upper end of the piston head; approximately in contact with the upper flange of the same, in the form of structure shown in Fig. 2, and in the position illustrated in Fig. 7, in the form of structure which omits the upper flange; said washer or gasket having turned over and over in its movements with and with respect to the piston head.

The depression of the plunger expels a certain amount of air from the pen barrel and creates a partial vacuum within the same so that when the spring retracts the cap with the plunger, ink will be drawn into the pen barrel, and such pumping operations may continue until the pen barrel is charged with ink to the desired extent.

In the structure shown in Figs. 1, 2 and 3, an

In the structure shown in Figs. 6 and 7, I have shown a form of plunger 250 in which a single washer 30<sup>a</sup> is employed; the latter functioning to close the space between the pen barrel and the body of the plunger; thereby effecting a liquid-tight joint during movement of the plunger, while at the same time, when the pen is in the writing position, such washer also serves to seal the joint between the plunger and the tubular fitting in the end of the pen barrel, through which the plunger operates. In this form of such fitting, the lower part is bored for the reception of the piston and an annular rib provides a shoulder 22<sup>a</sup> against which the spring 28 abuts.

As in the structure shown in Figs. 1, 2, and 3, the pen barrel shown in Fig. 6 is threaded at its upper end to receive the tubular fitting which terminates externally of the barrel in a flange beyond the pen barrel and is provided internally with an annular shoulder. The plunger structure, which carries the piston, may also be hollow and has a reduced tubular portion extending above the wall of the fitting and receiving a cap at its upper end. Between such cap and the shoulder of the fitting, a coiled spring of suitable strength is interposed; whose function is to return the plunger after manual operation of the same. In this case, the piston portion 250 of the plunger enters the enlarged bore in the lower end of the tubular fitting and has at its lower end a flange, 25<sup>b</sup>. The resilient washer or gasket 30<sup>a</sup>, which may be of rubber or any other material capable of performing the desired function and available for use in connection with any form of ink which may be employed in a fountain pen, is mounted on the piston 250, and its limits of movement in both directions is indicated in Figs. 6 and 7.

As has been explained, the washer or gasket is of relatively small sectional area and when the piston head is operated, such gasket will roll on the same. When in the position of use, as illustrated in Fig. 6, it lies between the flange of the piston and the lower end of the tubular fitting 13; sealing the joint between the latter and the piston. When the piston is operated, the frictional engagement of the inner wall of the pen barrel with the outer surface of such washer or gasket, causes it to roll on the piston head, at the same time maintaining the desired liquid-tight joint between the piston and the pen barrel.

The rolling action of the washer or gasket 30 (or 30<sup>a</sup>) with respect to the piston, is diagrammatically illustrated in Figs. 9 and 10; the arrows indicating the direction of movement of the several parts.

In the form of air tube shown in Figs. 1, 2 and 3, a slitted end is provided which is in frictional engagement with the bore of the plunger so that movement of the latter will be imparted to such air tube in both directions for a limited extent and, in addition, the air tube is provided with a cross-bore at the end of its slits. This cross-bore is never closed by the piston, as may be observed from an examination of Figs. 1 and 2. In the form of structure shown in Figs. 6 and 7, the

additional gasket or washer is provided to seal the joint between the plunger and the tubular fitting. In the structure shown in Figs. 6 and 7, the washer or gasket carried by the piston head performs this additional sealing function.

It will be clear from an examination of the drawings and full consideration of the foregoing description, that I have produced a novel and efficient form of fountain pen filling mechanism, and one that may be associated with a fountain pen barrel in a very simple manner. The whole pumping mechanism is carried by the tubular fitting in threaded engagement with the end of the pen barrel, and may be inserted and removed as a unit. Aside from any other consideration and entirely beside the idea that repairs might ever be necessary, replacement of the pumping mechanism in case of accidental breakage or impairment is a very simple operation; it merely being necessary to remove the tubular fitting and with it the pumping elements, and then to insert a new unit pumping structure. My improved structure may be inserted in the barrel of a fountain pen by simply providing the end of the same with internal threads adapted to receive the externally threaded tubular fitting 13. And such mechanism includes the closure or cap 14, which fits the exposed threads of the tubular fitting 13, projecting beyond the end of the pen barrel.

While I have shown a form of air tube that is in frictional engagement with the bore of the plunger so as to be moved by the same, and is arranged to have its lifting movement arrested by the cross pin 38 carried by the pen section and overlying the enlarged end of the same, a similar stop might be carried by the piston or plunger and arranged to cooperate with an elongated slot formed in the upper end of the air tube; the latter, in such instance, being free to move in the bore of the plunger. In such arrangement, the position of the stop pin carried by the plunger will be such as to engage the upper end of the slot at the end of a retractive movement and raise the lower end of the air tube from engagement with the seat of the pen section to an extent equalling that indicated in the form of structure illustrated in Figs. 1 and 6.

The size of the enlargement 35<sup>a</sup> at the end of the air tube and the position of the cross pin 38 are such that the air tube may be readily disengaged from the pen section, if and when necessary, in connection with any use of the fountain pen, or when assembling or disassembling the same.

I claim:

1. A fountain filling device comprising a self-contained entity attachable to and detachable from the barrel of a fountain pen as a unit, comprising a tubular member fitting the end of the barrel, a plunger reciprocable in said sleeve, a spring resisting movement of said plunger in one direction and serving to return the same when pressure thereon is relieved; said plunger having a piston head with spaced flanges, and a rollable washer carried by said piston head between its flanges and sealing the space between the same and the wall of the pen barrel.

2. A fountain filling device comprising a self-contained entity attachable to and detachable from the barrel of a fountain pen as a unit, comprising a threaded sleeve fitting the end of the barrel, a plunger reciprocable in said sleeve, a cap carried by the plunger, a spring interposed between the sleeve and cap for resisting movement of said plunger in one direction and serving to

return the same when pressure thereon is relieved; said plunger having a piston head with spaced flanges, and a rollable washer carried by said piston head between its flanges and sealing the space between the same and the wall of the pen barrel.

3. A fountain filling device comprising a self-contained entity attachable to and detachable from the barrel of a fountain pen as a unit, comprising a tubular member fitting the end of the barrel, a plunger reciprocable in said sleeve, a spring resisting movement of said plunger in one direction and serving to retract the same when pressure thereon is relieved; said plunger having a piston head with spaced flanges, and a rollable washer carried by said piston head between its flanges and sealing the space between the same and the wall of the pen barrel; said washer having rolling movement with respect to said piston head as the latter is moved during a pumping action and occupying a sealing position with respect to said sleeve when the plunger is in the retracted position.

4. In a reciprocating piston device for filling fountain pens and the like, the combination of a pen barrel, a pen section carrying a writing implement and associated parts mounted in one end of said barrel, an air tube associated with the pen section, a tubular fitting secured in the opposite end of the barrel, a plunger reciprocable in said fitting and bored to receive the upper end of the air tube, a rollable washer carried by the plunger and sealing the space between the latter and the inner wall of the pen barrel; said washer also serving to seal the joint between the plunger and the tubular fitting, and a spring serving to effect return movement of the plunger.

5. In a reciprocating piston device for filling fountain pens and the like, the combination of a pen barrel, a pen section and associated parts carried by one end of the same, an air tube associated with said pen section, an externally threaded tubular fitting secured in the end of the barrel opposite said pen section; said fitting having a plurality of bores and providing an internal shoulder, a hollow plunger movably mounted in said fitting and having a piston head normally occupying a position in one of said bores, a spring engaging said shoulder and serving to retract said plunger and maintain its piston head in the raised inactive position; said piston head loosely fitting the pen barrel, and a rollable washer carried by the piston head and having movement thereon between the same and the inner wall of the pen barrel and sealing such space when the plunger is actuated to effect a pumping action by said piston head.

6. In a fountain pen filling device, the combination of a pen barrel or reservoir, a hollow pumping piston movable therein, a tubular fitting detachably mounted in the end of the pen barrel, a hollow plunger for actuating said piston reciprocable in said fitting, and a movable air tube in frictional engagement with said hollow plunger and cooperating therewith.

7. In a reciprocating piston device for filling fountain pens and the like, the combination with a pen barrel, pumping mechanism at one end of the same including a hollow plunger, and a pen section at the opposite end of the barrel, of an air tube extending into said hollow plunger and in frictional engagement therewith; said air tube being adapted to seat against the pen section upon a forward stroke of the plunger and to

be lifted from said seat upon a return stroke of the plunger.

8. In a reciprocating piston device for filling fountain pens, and the like, the combination with a pen barrel, pumping mechanism at one end of the same including a hollow plunger, and a pen section at the opposite end of the barrel, of an air tube extending into said hollow plunger and in frictional engagement therewith; said air tube being adapted to seat against the pen section upon a forward stroke of the plunger and to be lifted from said seat upon a return stroke of the plunger, and means carried by the pen section for limiting the lifting movement of the air tube.

9. In a reciprocating piston device for filling fountain pens and the like, the combination of a headed plunger having a reduced stem, a pen barrel in which such plunger may move, a tubular member at the end of the barrel in which the stem of the plunger is reciprocable; said stem and plunger being hollow, a washer or gasket interposed between the plunger and the inner wall of the barrel and capable of rolling on the plunger as the latter is reciprocated, and an air tube detachably mounted in the barrel and frictionally connected with the plunger for movement thereby.

10. In a reciprocating piston device for filling fountain pens and the like, the combination of a pen barrel, a reciprocating plunger having flanges with a reduced portion between the same, a washer carried by the reduced portion of the plunger in engagement with the barrel and adapted to roll on the plunger during its reciprocations, a tubular shell connected to the end of the barrel in which the plunger may move, and a spring associated with said tubular shell for retracting the plunger after a manual movement thereof.

11. In a reciprocating piston device for filling fountain pens and the like, the combination of the pen barrel, a sleeve fitting the end of the same, a hollow plunger with a reduced stem reciprocably mounted in said sleeve; said plunger

having spaced flanges at one end with a cylindrical portion between the same, a rollable washer disposed between said cylindrical portion of the plunger and the pen barrel and forming a liquid-tight seal with the latter, an air tube within the barrel in frictional engagement with said plunger and movable therewith, and a spring for retracting said plunger following release of an inward movement of the same.

12. In a reciprocating piston device for filling fountain pen barrels and the like, the combination of a pen barrel, a hollow plunger, a sealing ring carried by the plunger and in engagement with the pen barrel for sealing the space between said parts; said sealing ring being capable of rolling movement with and independently of the plunger, means for retracting the plunger, an air tube frictionally engaging the plunger and movable with the same, and means for limiting the movement of the air tube independently of the movement of the plunger.

13. In a reciprocating piston device for filling fountain pens and the like, the combination of a pen barrel, a hollow plunger reciprocably mounted in one end of the same, a pen section detachably secured to the opposite end of said pen barrel, an air tube located within the pen barrel and operatively associated with said pen section and in frictional engagement with the bore of the hollow plunger; the latter being operable from a point externally of the pen barrel, a rollable washer mounted on said plunger between the same and the pen barrel and movable with and with respect to said plunger, and means carried by the pen section for limiting movement of the air tube in both directions.

14. In a fountain pen filling device, the combination of a pen barrel, a plunger having a longitudinal bore and reciprocable in the pen barrel, and a movable air tube extending into the bore of the plunger; said air tube having a split end with outwardly flared parts to frictionally engage such bore.

HENRY C. KLAGGES.