(No Model.)

2 Sheets—Sheet 1.

W. W. STEWART.

FOUNTAIN PEN.

No. 542,450. Patented July 9, 1895.

FIG. 1.

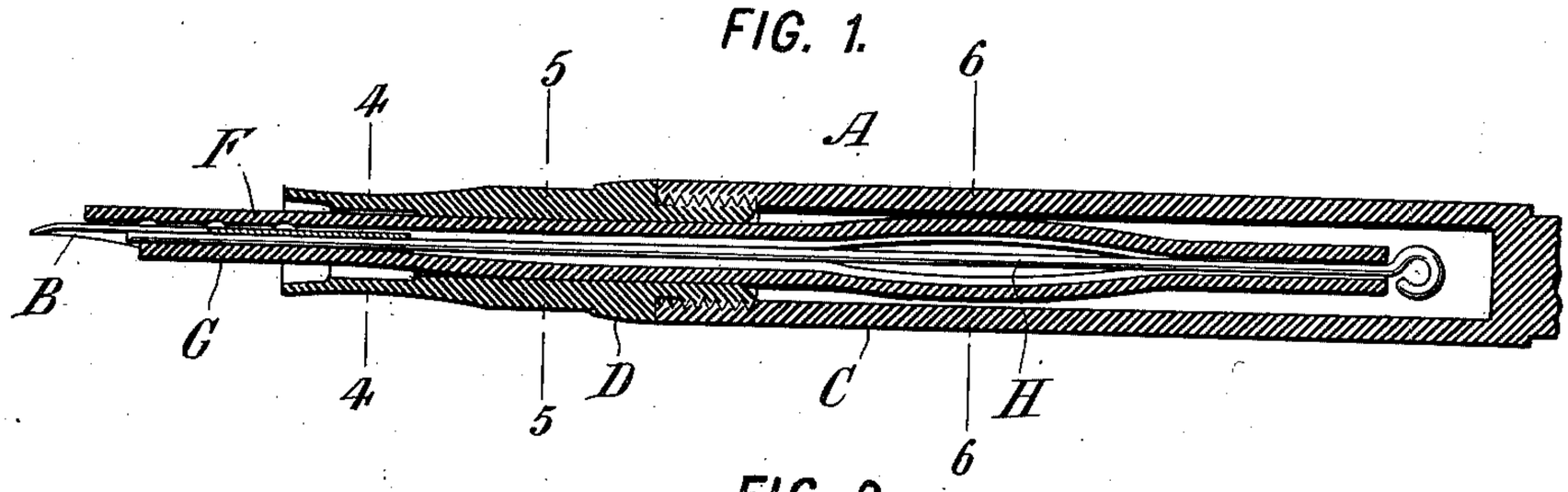

FIG. 2.

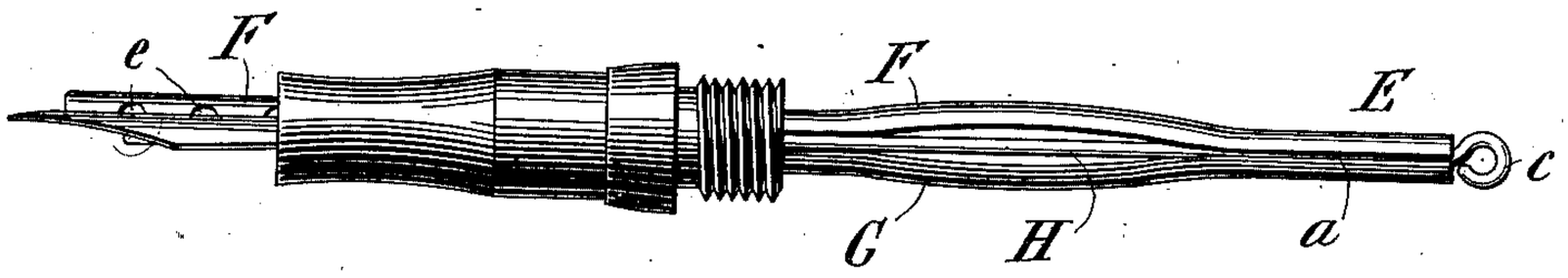

FIG. 3.

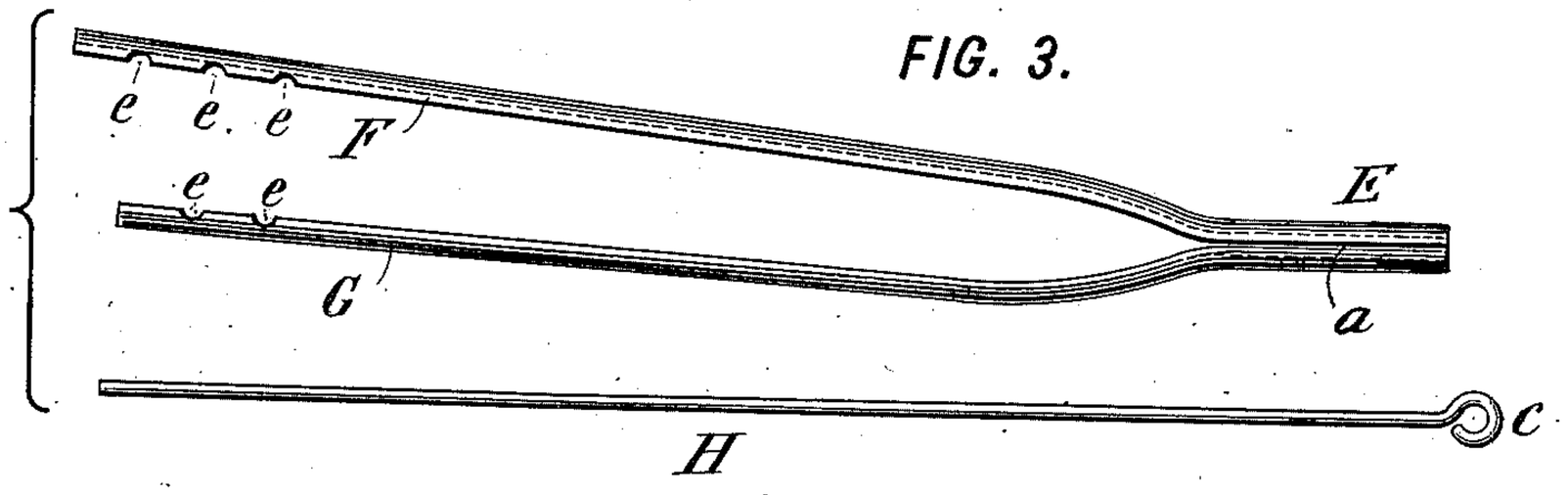

FIG. 4.

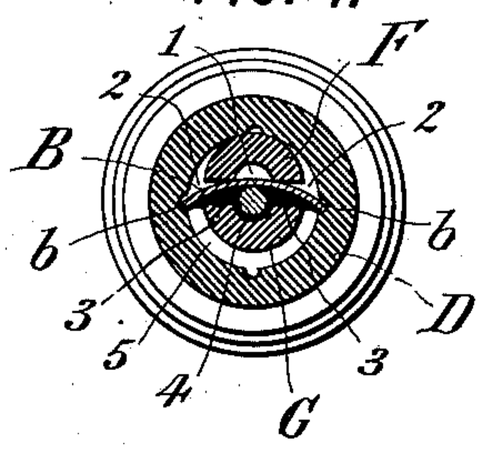

FIG. 5.

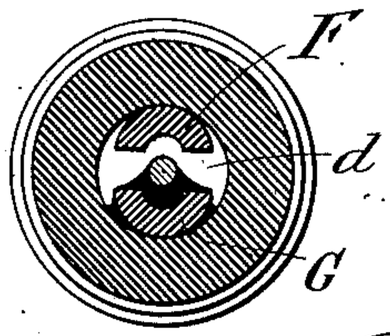

FIG. 6.

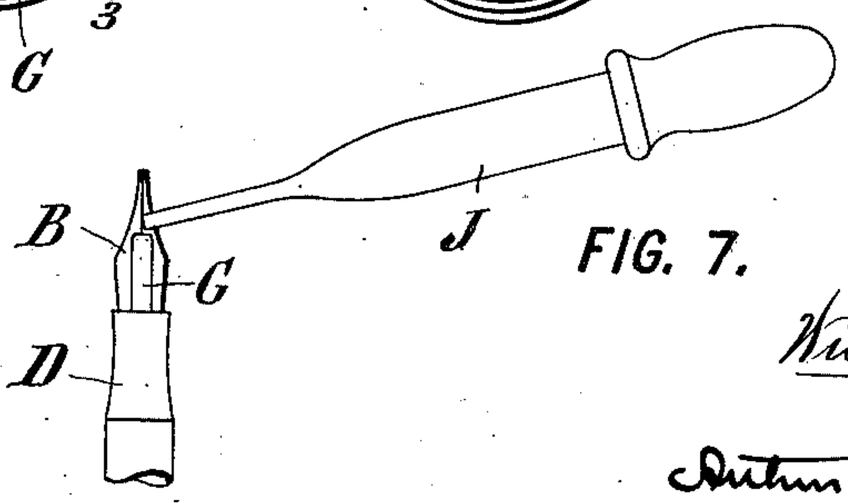

FIG. 7.

WITNESSES:

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(No Model.) 2 Sheets—Sheet 2.

W. W. STEWART.

FOUNTAIN PEN.

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FIG. 8.

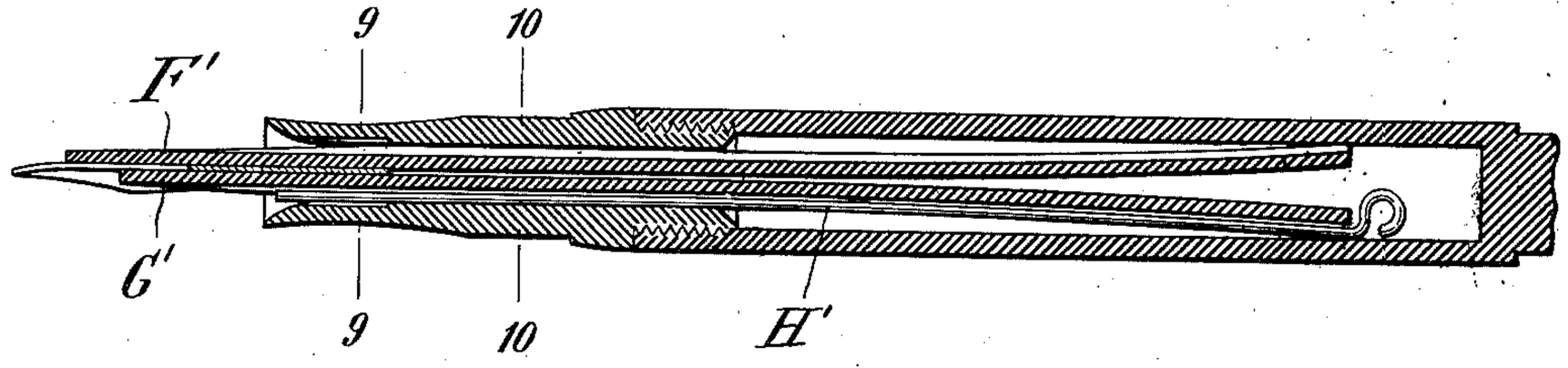


FIG. 9.

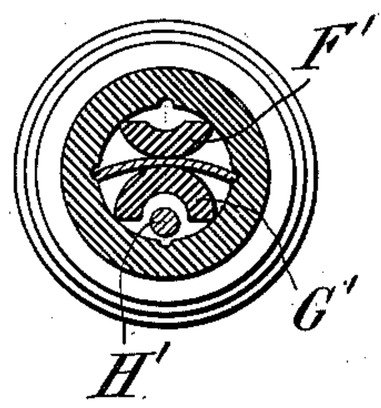


FIG. 10.

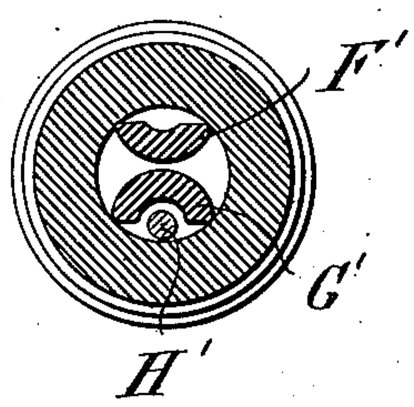


FIG. 11.

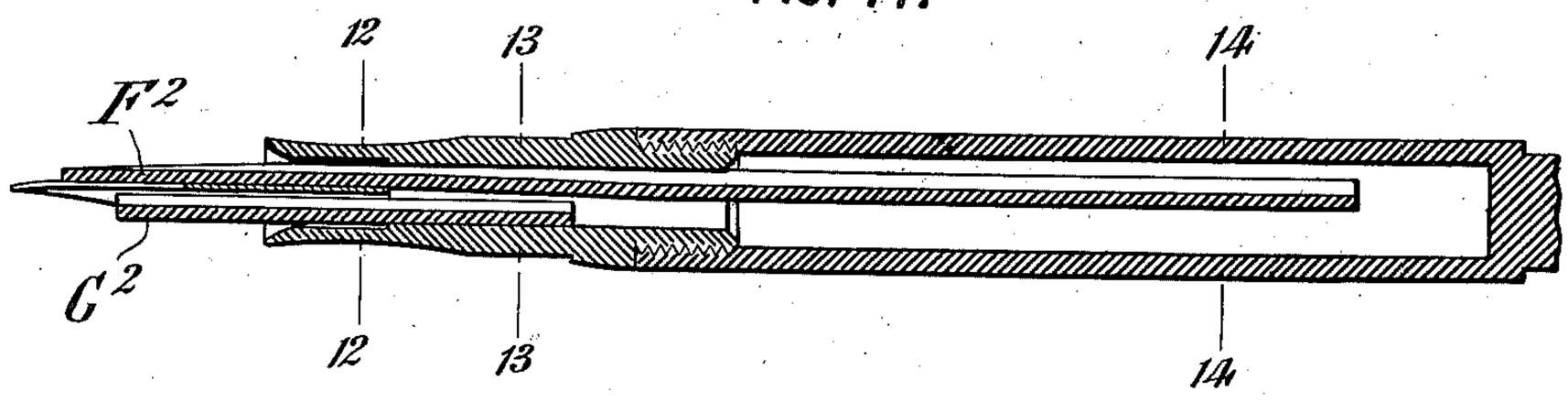


FIG. 12.

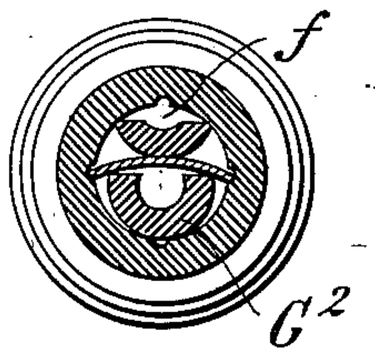


FIG. 13.

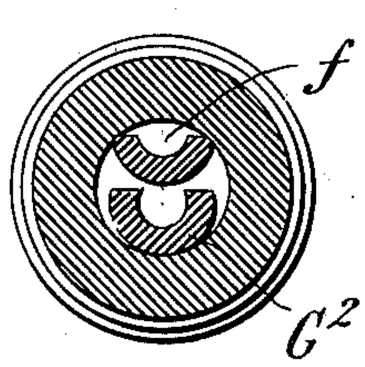
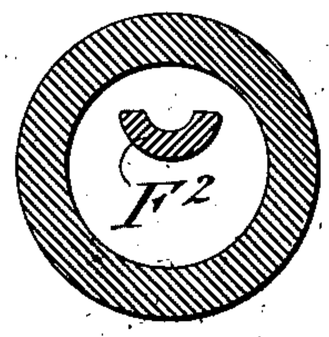


FIG. 14.



WITNESSES:

C. E. Ashley

H. W. Lloyd

INVENTOR:

William W. Stewart,

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UNITED STATES PATENT OFFICE.

WILLIAM W. STEWART, OF BROOKLYN, NEW YORK.

FOUNTAIN-PEN.

SPECIFICATION forming part of Letters Patent No. 542,450, dated July 9, 1895.

Application filed March 23, 1894. Serial No. 504,759. (No model.)

To all whom it may concern:

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

The object of this invention is to produce a fountain-pen which can be filled from the exterior and without unscrewing any nozzle or pen-section, and which at the same time shall give a suitably-graduated flow as a writing-pen.

Every user of a fountain-pen must recognize the inconvenience of refilling the reservoir in the ordinary manner—namely, by unscrewing the nozzle or pen-holding section and then injecting the ink from a so-called "filler" or "glass dropper" into the open end of the barrel or reservoir and again screwing on the nozzle. Often the nozzle is screwed on so tightly or becomes so cemented with ink that it is almost impossible to unscrew it, and there is considerable liability of smearing the fingers with ink upon withdrawing the nozzle and ink-feeder from the reservoir. There is also danger of filling the reservoir too full, so that it overflows; and with many fountain-pens the act of screwing back the nozzle into the barrel causes an overflow of ink through the nozzle, or the spattering of the ink by reason of the compression of the air in the reservoir, which air can only escape by forcing its way out through the film or small quantity of ink contained in the capillary interstices within the nozzle by which the ink is led to the pen. The advantage of a fountain-pen which can be filled by an ordinary glass filler from the exterior and without unscrewing the nozzle must, therefore, be apparent. It would be easy with most fountain-pens to so modify their construction as to enable them to be filled in this way—that is, by increasing the size of the capillary passages or interstices through the nozzle; but after so modifying the pen it would be found that the conductivity of ink is so greatly increased, and the adhesive control upon the ink so reduced, that in writing the pen is liable to give too free a flow, so as to drop ink or bleed. I have succeeded in devising a construction which admits of external filling and at the same time insures against this bleeding.

My improved fountain-pen has, further, the advantage that it adapts itself automatically to widely-different rates of flow, so that with the same pen hair-line writing on the one hand or heavily-shaded writing on the other may be equally well executed.

In carrying out my invention I adopt such a construction as will insure that the ink if introduced against either a top or under feeder outside the nozzle when the pen is held inverted shall be conducted down through the nozzle and to the closed end of the reservoir through capillary spaces or along capillary surfaces, and under such degree of capillary control as to prevent it from overflowing into other spaces or interstices which are provided through the nozzle, and which are thus kept clear or free for the unobstructed blowing out of the air which is expelled from the reservoir by the inflowing ink. I believe it to be a law of the movement of fluids that the ink will be attracted to and will fill those spaces which are most minute or wherein the surfaces are closest together, while the air will seek the larger spaces, where it is able to retain a nearer approach to cylindrical or spherical form. If the interstices through the nozzle had free communication with one another, and were of approximately uniform shape and size, the stream of ink introduced at the exterior would flow down through the nearest interstices, and at the same time would flow therefrom laterally into the other interstices, and would fill all the interstices or spaces in the nozzle and remain hanging or clinging against the surfaces thereof, and would seek to flow down simultaneously through all the interstices, so that its flow would continue only until the air in the reservoir was sufficiently compressed to sustain the column of ink, thus accumulated in the nozzle above, whereupon it would be impossible to introduce any further quantity of ink. This is what occurs in almost any ordinary fountain-pen when attempting to fill it from the exterior. By carrying one or more capillary surfaces from the nozzle through to the lower end of the reservoir this difficulty may be somewhat obviated by conducting a portion of the ink down underneath the body of air, but as the latter cannot escape without displacing some of the ink which clogs the nozzle either the entrance of ink ceases or

the air by its compression forces its way through the obstructing ink in the nozzle and escapes in the form of bubbles, which burst as they emerge, and which being encircled by films of ink, spatter the ink in all directions as they burst. These difficulties are overcome in my construction by providing passages or interstices through the nozzle which are of such shape as to afford capillary spaces of unequal size, or having surfaces unequally seperated from one another, so that the descending stream of ink shall cling to the surfaces most closely adjacent and shall leave the wider spaces free for the outflow of air as it is expelled from the reservoir. An absolute separation between different interstices for at least a part of their length is also desirable and is readily effected by employing the pen itself as a partition dividing the nozzle. The ink being injected against one side of the pen, flows down on that side, enters and fills the minutest capillary spaces or the narrowest portions of the spaces, and descends or slides down against these surfaces, which continually conduct it to the lower end of the reservoir and carry it past the upwardly-flowing current of air without the ink being diverted laterally, so as to overflow into and fill and obstruct the other interstices through which the air is given vent.

My invention may take numerous different mechanical forms, it being only essential that the spaces or interstices left between the mechanical parts passing through the nozzle shall conform to the conditions just stated and that one of such parts shall constitute an extension passing through the reservoir, to which the ink may cling and by which it shall be guided in its passage toward the closed end of the reservoir, in order that the ink may be delivered beneath the body of air to expel it, instead of over any portion of the air, so as to imprison it. Preferably I employ one or more feed bars or tubes extending continuously from the pen-slit through the nozzle and to within a short distance of the closed end of the reservoir; but the construction of such mechanical bars or tubes may be greatly varied.

In practice I prefer a split or slitted tube in connection with the pen, the shank of the latter dividing the opening or throat through the nozzle, so that one half of the divided tube passes against the outer or convex side of the pen, while the other half lies against its inner or concave side. I also by preference employ a wire thrust through the bore of the tube to further contract the spaces.

Figure 1 of the accompanying drawings shows a fountain-pen of my improved construction in longitudinal mid-section. Fig. 2 is a side elevation of the nozzle, pen, and ink-conductors removed from the barrel. Fig. 3 is an elevation of the ink-conductors detached. Figs. 4, 5, and 6 are transverse sections on a larger scale, cut on the lines 4, 5, and 6, respectively, in Fig. 1. Fig. 7 is an elevation showing the operation of injecting ink. The remaining figures illustrate modified constructions. Fig. 8 is a longitudinal section of one modification, of which Figs. 9 and 10 are transverse sections on a larger scale, cut in the planes of the lines 9 9 and 10 10 in Fig. 8. Fig. 11 is a longitudinal mid-section of another modification, of which Figs. 12, 13, and 14 are transverse sections on a larger scale, cut in the planes of the lines 12 12, 13 13, and 14 14, respectively, in Fig. 11.

Referring to the drawings, let A designate the reservoir-holder in each construction, and B the pen. It is essential to such a reservoir-holder that it be closed at the upper or rear end and partially closed or obstructed at the lower or pen-holding end, commonly called the "nozzle." For convenience of construction the holder A is made in two parts—namely, a barrel C and a nozzle or pen-section D—which are screwed together and which in ordinary fountain-pens are unscrewed in order that the reservoir may be filled with ink. The reservoir is the hollow space within the holder A.

The pen B, which may be a gold, steel, or other pen, may be variously fitted or mounted in the nozzle, but preferably so that its shank shall constitute a partition dividing the bore or throat through the nozzle, as hereinafter explained.

It is common in fountain-pens to provide an ink-feeder or feed tube or bar extending through the nozzle, and either under or over the pen and projecting into the mass of ink in the reservoir to a greater or less distance, so as to form a capillary feeder for conducting or drawing the ink from the reservoir down to the slit in the pen. In some cases two or more such bars are employed, sometimes being arranged both above and below the pen and sometimes being tubular and provided with an internal wire or rod to subdivide the tubular bore and control the air-bubbles. In any case such feeders by passing through the nozzle divide the opening or passage therethrough into small spaces called "capillary interstices." These spaces are small enough so that their bounding surfaces approach so closely together as to have a capillary control over the ink which enters the interstices, so that this ink shall be restrained from falling or dropping out of the interstices, while no obstacle is presented to its being drawn through them, as required in writing, to supply the pen. According to my present invention these feeders or feed-bars are so constructed as to impart to them a new function—namely, that of conducting the ink into the reservoir when filling the pen, as well as of conducting it from the reservoir down to the pen-slit in the act of writing. I therefore call them "ink-conductors." They may be one, two, or more in number, according to circumstances, and they may constitute the sole means for subdividing the passage through the nozzle into capillary interstices,

or other means may be provided to that end in addition to them.

I will now proceed to describe the specific construction shown in Figs. 1 to 7, inclusive.

I take a straight tube E, preferably of hard rubber, and slit it through the middle from one end nearly to the other, and then by softening the rubber by heat I bend the two legs thus formed slightly, so that they stand about as shown in Fig. 3. Preferably one side of the tube is slitted through entirely to the end, forming the slit *a*. By this construction the greater part of the tube is divided into two legs, (lettered F and G, respectively,) and these constitute two ink-conductors. They might be wholly disconnected from each other, but for convenience, and because it is not desirable to have so many parts, they are connected through the undivided portion of the tube. This structure which as a whole I will call the "tube," is thrust through the nozzle D with its two legs or conductors F G emerging at the front, respectively, above and below the pen B and extending parallel with the pen-shank and communicating with the slit thereof, so that they serve as feeders for the ink when the fountain-pen is in use.

In the construction shown the pen B is fixed in place by its shank, which is slightly narrowed, being forced into diametrically-opposite grooves *b b* in the nozzle D, as shown in Fig. 4. In addition, and in order further to reduce in size the capillary interstices, I thrust a wire H, preferably of silver, through the tube E from the rear, this wire being long enough to emerge beyond the end of the conductor G beneath the pen, as shown. It is preferably formed with an eye *c* at its inner end to prevent its slipping out and is held from slipping back when in place by frictional contact with the conductor G and the pen. Preferably, also, the inner end of the tube E is pinched in against this wire so as to frictionally grasp it. By referring to Fig. 4 it will be seen that this construction provides a number of different-shaped interstices within the nozzle of the holder, and communicating more or less directly with the pen-surfaces. On top of the pen are a half-round interstice 1 and two bifurcated interstices 2 2, their two branches tapering off until their side walls come into contact. Beneath the pen are two tapering interstices 3 3, against its under surface, a meniscus-shaped interstice 4 between the wire H and the conductor G, and an extended narrow interstice 5 between the outer face of the conductor G and the inner wall of the nozzle. Back of the heel of the pen and in the plane of the section in Fig. 5 the parts are somewhat differently disposed, leaving the interstices as shown in Fig. 5. Still farther back and within the reservoir the parts are disposed as shown in Fig. 6.

To fill this fountain-pen without unscrewing the nozzle, as my invention contemplates, it is held inverted and an ordinary filler (shown at J in Fig. 7 and consisting of a glass tube drawn to a point and fitted with a compressible rubber bulb, being first filled with the ink in the well-known manner) has its tube placed against the fountain-pen in the position shown in Fig. 7, whereupon, by compressing the bulb slowly, the ink is expelled from the filler in a steady stream against one of the ink-conductors F or G and descends along this conductor into the reservoir without interruption of its flow by the air which is expelled by displacement by the entering ink. If the attempt were made to fill in this manner any ordinary fountain-pen not constructed according to my invention, the ink introduced at the nozzle would quickly fill and occupy all the spaces or passages through the nozzle and would then overflow without entering in any considerable quantity into the reservoir, for the reason that the ink would itself seal the only openings through which the confined air could escape from the reservoir, so that the ink attempted to be introduced would rest in a bath supported above the volume of air which is imprisoned in the reservoir; but by my improved construction the ink which is thus delivered from the filler J descends in a direct stream into the lower part of the reservoir without filling all the interstices through the nozzle, and hence without obstructing the orifices through which the air is expelled. For example, placing the filler J against the concave side of the pen, as shown in Fig. 7, and directly over the conductor G, as shown, the ink delivered from it enters at once into the interstices marked 3 4 in Fig. 4, in which interstices it is shown by solid black in that figure. It descends through this as far as the heel of the pen, and then clings to the surfaces of the conductor G and wire H, descending against them in the manner shown by solid black in Fig. 5. After the ink passes the contraction of the nozzle and enters the open chamber of the reservoir there is but slight liability of its obstructing the movement of air, provided only that it has some conducting-surface to cling to as it descends. In Fig. 6 it is shown as flowing down in the spaces between the conductor G and wire H and the inner wall of the reservoir, either or both of which it may follow. The opening or swelling apart of the conductors F G, within the reservoir, in the manner shown, is found to be practically desirable with this construction, since without this feature the inflow is less free and there is some liability that all the air may not be expelled. The bowing apart of the conductors seem to have the effect of so separating their walls as to admit air between them, so that the air escaping from the reservoir may enter the unoccupied space or interstice marked *d* in Fig. 5. Farther up the air escapes through the interstices 1 2 2, shown in Fig. 4. The course of the ink described is that which it commonly takes upon first introducing ink when all the surfaces within

the holder are dry, so that the course taken by the ink may be ascertained by taking the fountain-pen apart and noting which surfaces are wetted. In the ordinary use of a fountain-pen, however, it is refilled while the internal surfaces, which are protected from evaporation, are still moist, and in such case it may be that the ink will descend by some slightly-different path, although this is not probable, since practical experiment shows that the filling of the reservoir occurs to the same apparent effect whether the interior surfaces be wet or dry. The point at which the ink is injected, however, has a considerable influence upon the path it takes. If the filler J is applied to the opposite side of the pen at the top of the conductor F, the course of the ink will be on the reverse side compared with that described—that is, it will be along the conductor F and between it and the wire H, while the spaces shown in Figs. 4, 5, and 6 as being occupied by ink remain free for the escape of air. If, however, the top of the filler be placed against the side of either conductor F or G, the effect is not materially different, except that the ink instead of descending directly appears to be drawn laterally into the more minute interstices between the adjacent conductor and the pen, and then to descend, although some portion of it appears to descend directly along the exterior or convex face of the conductor. The stream of ink may be directed by the filler over any of the interstices through the nozzle, and in either case the filling can be effectively performed.

The operation of the pen in filling is due to two forces—namely, gravitation and capillary attraction or adhesion. By gravitation the ink tends to descend rapidly into the reservoir, and does so descend if a clear path be afforded it and its movement be not opposed by the resistance offered by compressed air. To afford the path or guide for the ink capillary attraction or surface adhesion of the interstices is resorted to. It is well known that capillary attraction in an interstice varies inversely as the distance apart of the walls or bounding-surface of the interstice, so that it is much stronger in the narrow spaces than in the wider ones, and consequently the ink that is introduced is instantly drawn into the narrowest spaces or interstices with which it can communicate, and while clinging to these surfaces it is drawn down into the reservoir by gravitation. The flow of the ink into all of the spaces or interstices so as to choke them up and prevent escape of air is avoided in part by the partition that is afforded by the shank portion of the pen B, which extends for a considerable distance into the bore or throat of the nozzle and serves to divide it. This division is sufficient to impart direction to the ink, so that it is already started and rapidly moving downward before it has any possible communication with the interstices on the opposite side of the pen. After leaving the heel of the pen the ink clings to those surfaces nearest it, and being drawn down by gravitation as rapidly as it is introduced it has no opportunity to accumulate and overflow and leap across to the more remote surfaces. Consequently the larger spaces are left free for the movement of air, so that thus a clear path is preserved through which the air may be blown out, as its place is taken by the introduced ink.

An important feature of my invention is the provision of notches *e e* in the protruding ends of the conductors F and G. The effect of these notches is to afford free and ample communication between the supply of ink and the pen, so that the pen is enabled to supply rapidly and continuously a large volume of ink when required for shading or heavy writing. These notches form little chambers or cross-passages in which an added amount of ink can cling, constituting thus a sort of supplementary reservoir. Aside from this feature the operation of my improved fountain-pen in writing is substantially the same as that of other fountain-pens of this same general character. The ink descends to the pen as it is required, being drawn down by the ink-conductors from the mass of ink in the reservoir, and its place being taken by air which gradually works up into the reservoir through the interstices or passages through the nozzle.

In the construction shown in Figs. 8 to 10 the two conductors, here lettered F′ and G′, respectively, are disconnected from each other, each being a half tube, and are turned back to back in the manner best shown in Figs. 9 and 10. The wire H, here lettered H′, is shown as applied in the hollow of the lower conductor G′, although a wire might be applied to both with advantage. Within the reservoir the conductors separate or flare apart, as shown in Fig. 8. By this construction a more complete separation of the interstices is afforded than in that first described, but without materially affecting the operation. The first construction is considered preferable on account of the less number of disconnected parts and because of the more ample flow and greater capacity for shading, due to the arrangement of the hollow of the conductors against the pen in connection with the notches *e*. This modified construction can be filled by applying the ink to either the upper or under sides of the pen.

Figs. 11 to 14 show a further modification in which only one conductor is employed, extending to or near the closed end of the reservoir. This conductor (lettered F^2) extends along the top of the pen and through the nozzle and into the reservoir, being identical in construction with the conductor F′ in Fig. 8. Beneath the pen and extending part way through the nozzle is a bar, (lettered G^2,) which constitutes a partial conductor, its main purpose, however, being to obstruct the flow through the nozzle sufficiently to form suitably-restricted interstices. It consists of a

channeled bar or part of a tube arranged with its hollow against the concave side of the pen, as shown in Fig. 12. This construction of pen is best filled by introducing the ink against the conductor F^2. It is, however, feasible to fill it by introducing the ink within the bar G^2, from the lower end of which the ink apparently flows down against the walls of the reservoir or against the convex surface of the conductor F^2, while the air apparently escapes through the interstice *f*.

The construction of the ink-conductors as half-round or grooved bars or tube sections is not essential, as bars of other shapes may be substituted, but those shapes or any shapes introducing segments of circles I find to give the most effective results. My invention may be otherwise considerably modified in construction without departing from its essential features.

My invention introduces a new principle of action in fountain-pens and realizes a practicable "self-filling" fountain-pen, so-called, or one which can be filled without taking it apart, the desirability of which has long been felt.

Throughout this specification I have assumed as well known that a fountain-pen acts oppositely when in a dry or unsaturated condition, on being first filled, to its action when its surfaces become soaked or saturated and capillary action is established, this difference being most apparent with hard rubber as the material of the fountain-holder, this having been found the only practicable material. Some fountain-pens have been constructed in ignorance of this principle, so that they operate most perfectly only when first filled, and in a few hours, when the saturated condition has been reached, the flow being governed by different forces from those at first invoked, becomes uncontrollable by the writer. Heretofore some such pens have been made which, when dry, can be filled from the exterior, but which cannot be so filled or refilled when saturated under the conditions of practical use. My invention does not include such pens, but applies to such only as are constructed on correct principles for a practical automatic control of the feed of ink in writing by capillary action. My specification and claims are to be read on the understanding that such practical or operative condition of use is alone referred to.

I claim as my invention the following-defined novel features, substantially as hereinbefore specified, namely:

1. A fountain pen constructed with a reservoir holder closed at its rear end and having its pen-holding end or nozzle obstructed, the obstructed passage through said nozzle being formed as capillary spaces or interstices of varying widths including narrower portions for attracting ink and wider portions extending continuously from the reservoir to the exterior for the escape of air, so that in filling the inverted pen the ink will descend in the narrower spaces, and the wider ones will be left free for the outflow of air, and an ink-conductor constituting part of the obstruction of said nozzle, extending through the latter from the exterior and prolonged within the reservoir to near the closed end thereof, whereby in filling to serve as a guide to the entering ink to carry it to the lower part of the reservoir past the contained air to avoid imprisoning the latter or obstructing its escape.

2. A fountain pen constructed with a reservoir holder closed at its rear end and having its pen-holding end or nozzle obstructed, the obstructed passage through said nozzle being formed as capillary spaces or interstices of varying widths including narrower portions for attracting ink and wider portions extending continuously from the reservoir to the exterior for the escape of air, so that in filling the inverted pen the ink will descend in the narrower spaces, and the wider ones will be left free for the outflow of air, and an ink-conductor constituting part of the obstruction of said nozzle, extending through the latter from the exterior and prolonged within the reservoir to near the closed end thereof, and a partition in the nozzle separating the interstices on opposite sides of it, so as in filling the pen to tend to prevent the entering ink introduced into the interstices on one side thereof from overflowing into those on the opposite side and thereby choking them against the free escape of air.

3. A fountain pen constructed with a reservoir holder closed at its rear end and having its pen-holding end or nozzle obstructed, the obstructed passage through said nozzle being formed as capillary spaces or interstices of varying widths including narrower portions for attracting ink and wider portions extending continuously from the reservoir to the exterior for the escape of air, so that in filling the inverted pen the ink will descend in the narrower spaces, and the wider ones will be left free for the outflow of air, and an ink conductor constituting part of the obstruction of said nozzle, extending through the latter from the exterior and prolonged within the reservoir to near the closed end thereof, and the pen arranged in the nozzle to divide its bore and serve as a partition separating the interstices on opposite sides of it, so as in filling the pen to tend to prevent the entering ink introduced into the interstices on one side thereof from overflowing into those on the opposite side and thereby choking them against the free escape of air.

4. A fountain pen constructed with a reservoir holder closed at its rear end and having its pen-holding end or nozzle obstructed, the obstructed passage through said nozzle being formed as capillary spaces or interstices with the pen arranged in the nozzle to divide its bore, and an ink conductor or bar constituting part of the obstruction of said nozzle, extending from the exterior of the pen along the pen-shank, through the nozzle and into

the reservoir nearly to the closed end thereof, and constructed to form a continuous longitudinal capillary conductor to which the ink may cling as it descends into the inverted holder in filling, whereby the entering ink is restrained from obstructing the interstices through which the air escapes.

5. A fountain pen constructed with a reservoir holder closed at its rear end and having its pen-holding end or nozzle obstructed, the obstructed passage through said nozzle formed as capillary spaces or interstices with the pen arranged in the nozzle to divide its bore, and two ink conductors or bars constituting part of the obstruction of said nozzle, arranged on opposite sides of the pen and extending from the exterior through the nozzle and into the reservoir, and one or both prolonged within the reservoir to near the closed end thereof, and forming a continuous longitudinal capillary conductor to which the ink may cling as it descends into the inverted holder in filling.

6. In a fountain pen, the combination with the reservoir holder and pen, of two ink conductors or feed bars mounted on opposite sides of the pen loosely filling the nozzle of the holder so as to leave interstices around them, and extending from the exterior through the nozzle and into the ink reservoir, and longitudinally grooved or rounded so as to form approximately segments of tubes in cross-section, whereby they serve as feeders for taking the ink to the pen, and in filling the inverted holder one of them may serve to conduct the entering ink and carry it into the reservoir.

7. In a fountain pen, the combination with the reservoir holder and pen, of two ink conductors or feed bars mounted on opposite sides of the pen and extending from the exterior in parallel manner through the nozzle and loosely filling the nozzle so as to form varying interstices between them and the pen and nozzle, prolonged into the ink reservoir, and flared apart within the ink reservoir so as to form a clear space for movement of air between them.

8. In a fountain pen, the combination with the reservoir holder and pen, of two ink conductors or feed bars F and G constructed as segments of a tube mounted on opposite sides of the pen so that the latter divides their common bore, extended through the nozzle and into the ink reservoir, and flared apart in the latter to form a free passage between them for movement of air.

9. In a fountain pen, the combination with the reservoir holder and pen, of a divided tube E, the legs F G of which constitute ink conductors extending through the nozzle and lying against opposite sides of the pen, said legs being flared or bowed apart within the ink reservoir to form a space between them for movement of air.

10. In a fountain pen, the combination with the reservoir holder and pen, of two ink conductors extended along the pen and through the nozzle, and one or both prolonged into the reservoir to near the closed end thereof, and a wire extended along one of said ink conductors from the rear part of the reservoir to the pen.

11. In a fountain pen, the combination with the reservoir holder and pen, of two ink conductors consisting of longitudinally grooved or rounded bars as segments of tubes, extended through the nozzle, and one or both prolonged within the reservoir to near the closed end thereof, and a wire extended parallel with one of said ink conductors and lying in the groove thereof.

12. In a fountain pen, the combination with the reservoir holder and pen, of an ink conductor consisting of a longitudinally grooved bar as a segment of a tube extended through the nozzle into the ink reservoir and down along the pen, and constructed with notches *e e* in its portion communicating with the pen surface.

13. In a fountain pen, the combination with the reservoir holder and pen, of two ink conductors consisting of the opposite legs of a split tube extended through the nozzle and into the reservoir, and lying against opposite sides of the pen, and formed with notches *e e* on their projecting portions lying against the pen.

14. A fountain pen having continuous interstices through its nozzle of varying widths, graduated to fill with ink and bubbles of air in writing to control the flow, and so proportioned that when the pen is inverted and ink is supplied to the exterior, the ink descends into the reservoir through the narrower spaces and leaves a wider space or interstice unobstructed for exhalation of air, whereby the pen may be refilled without unscrewing the nozzle.

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

WILLIAM W. STEWART.

Witnesses:
ARTHUR C. FRASER,
FRED WHITE.