

(No Model.)

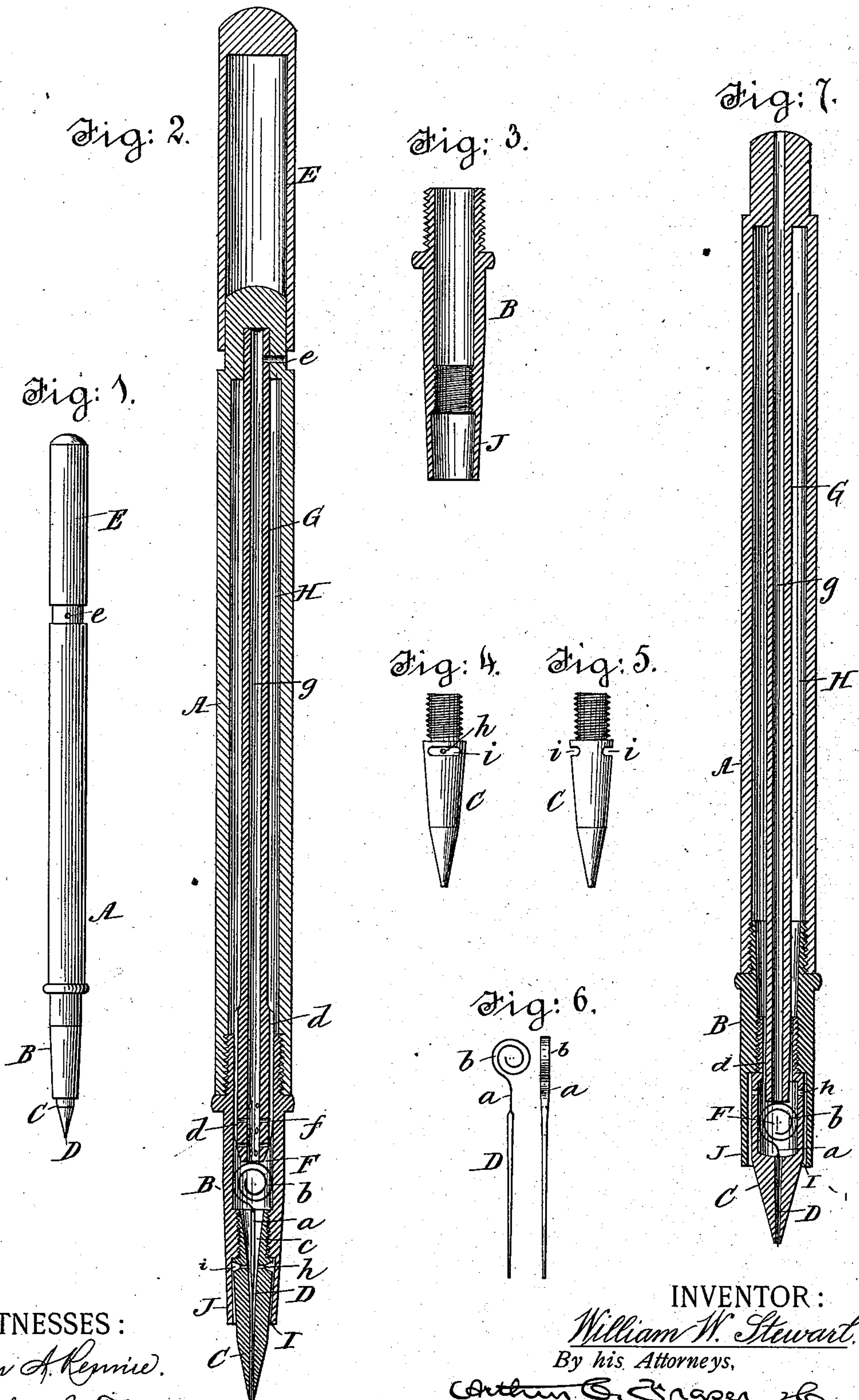
2 Sheets—Sheet 1.

W. W. STEWART.

FOUNTAIN PEN.

No. 376,760.

Patented Jan. 24, 1888.



WITNESSES:
John A. Rennie.
Paschal J. Ferraro

INVENTOR:
William W. Stewart.
By his Attorneys,
Arthur C. Grasen & Co.

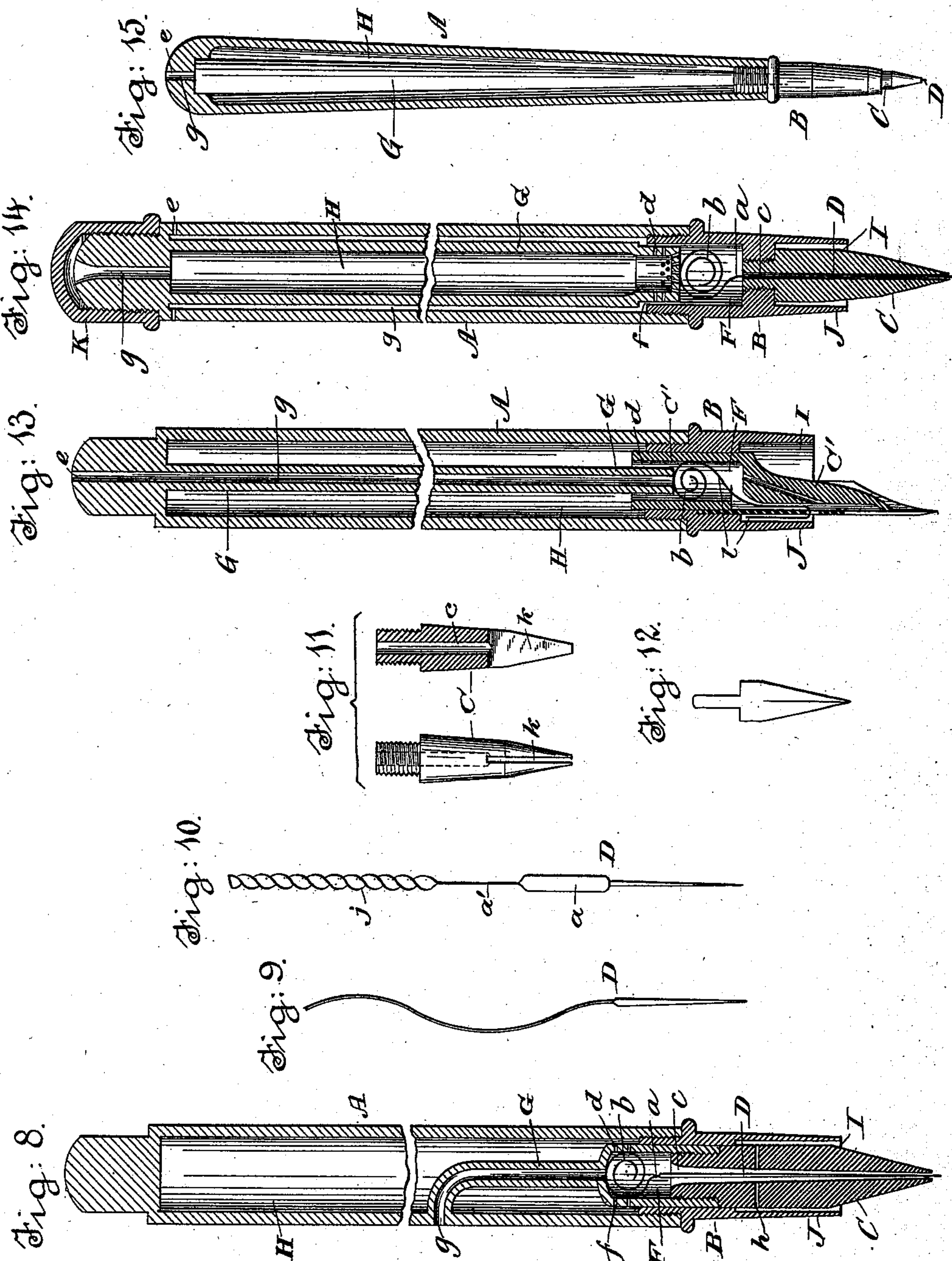
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UNITED STATES PATENT OFFICE.

WILLIAM W. STEWART, OF BROOKLYN, NEW YORK.

FOUNTAIN-PEN.

SPECIFICATION forming part of Letters Patent No. 376,760, dated January 24, 1888.

Application filed January 8, 1887. Serial No. 223,766. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM W. STEWART, a citizen of the United States, residing at 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.

This invention relates to fountain pens or pen-holders wherein the tubular handle or reservoir for holding the ink is closed or sealed at its upper end and the ink is conducted downward to the writing-point through a duct, its place in the holder being taken by air entering near the lower end.

The invention relates more especially to stylus or "stylographic" pens, although it is in part applicable to nib-pens.

Stylus-pens are especially subject to the defects of imperfect, intermittent, or irregular flow when in use and the leakage of ink when not in use. The object of my invention is to correct these imperfections and render the flow free, prompt, and proportional to the demand.

My invention provides for a more perfect interchange of ink and air in the reservoir than has been hitherto afforded. To this end the holder is constructed with a condensing-chamber, in which the ink and air are commingled, and with a vent duct or tube extending thence up through the holder and opening to the outer air at the upper part thereof.

My invention also provides several improvements in the construction of the holder.

Prior to my invention some fountain-pens have been made the construction of which approaches in some degree that provided by my invention.

My Patent No. 214,795, dated April 29, 1879, shows a holder constructed with a condensing-chamber which communicates with the reservoir by small holes and with the pen-nib through a duct supplemented by small vents, which alternately discharge ink and admit air. My Patent No. 237,454, dated February 8, 1881, shows a holder constructed with such a condensing-chamber, and with a vent-tube extending from the top of the holder down into the ink-reservoir and normally closed by the screw-cap of the holder, which screws upon its upper end. In order to regulate the suction within the holder, this cap

may be unscrewed slightly, thereby admitting a minute quantity of air into the vent-tube.

My Patent No. 291,800, dated January 8, 1884, shows a stylus fountain-pen wherein the stylus projects into or passes through a condensing-chamber, which communicates with the reservoir by small vents, and the holder of which is constructed with a vent-tube extending down from the top and closed by a screw-cap, as before. Around the tapered nozzle through which the stylus passes is an inclosing-jacket, which forms a nearly-closed annular space or chamber for the reception of any ink that may flow backward from the point, and this space communicates with the condensing-chamber through a small vent.

United States Patent No. 291,967, dated January 15, 1884, shows a nib-pen having a partial condensing chamber communicating with the pen, and with an air-tube extending into it from the top of the holder, where it opens laterally and is closed or regulated by a screw-cap, which screws over it.

The preferred form of my invention as applied to stylus-pens is illustrated in Figures 1 to 6, inclusive, of the accompanying drawings.

Fig. 1 is an elevation of the pen. Fig. 2 is a longitudinal mid-section thereof on an enlarged scale. Fig. 3 is a longitudinal mid-section of the nozzle detached. Figs. 4 and 5 are elevations of the conical point-section detached, and Fig. 6 is an elevation of the stylus removed. The remaining figures illustrate modifications. Figs. 7 and 8 are enlarged longitudinal sections answering to Fig. 2, showing two different constructions. Figs. 9 and 10 are elevations showing two modified forms of stylus. Fig. 11 includes an elevation and a longitudinal mid-section of a modified point-section, and Fig. 12 shows the writing-point or pen used therewith. Fig. 13 is an enlarged fragmentary longitudinal mid-section of the holder as adapted to the usual curved pen-nib. Fig. 14 is a longitudinal mid-section of a stylus-pen, and Fig. 15 is a sectional elevation of a tapered holder designed for very small pens.

I will first describe the construction shown in Figs. 1 to 6.

Let A designate the reservoir-holder, consisting, as usual, of a tube closed at its top,

either permanently, as shown, or by a screw-cap, if preferred; B, the nozzle-section, which screws into the lower end of the holder A; C, the point-section, which screws into the nozzle-section; D, the stylus or writing-point, and E the cap which incloses the parts B, C, and D when the pen is not in use.

The point-section C is bored through longitudinally, and the stylus D plays freely in its bore, as usual. The stylus is formed, as shown in Fig. 6, of a round wire or needle tapered toward the point, and having its upper portion flattened into a thin ribbon and coiled into a flat spiral, as clearly shown. The flattened portion *a* is left uncoiled, only the remainder of the flattened portion being coiled into the spiral *b*. The portions *a* and *b* constitute the spring-seating of the stylus. The spiral *b* is coiled with its convolutions out of contact with one another, preferably parallel with one another, and in capillary proximity to one another, so that the intervening spaces form a capillary channel for holding ink.

F is the condensing-chamber, which in this construction is located in the nozzle B. The stylus is arranged with its spiral *b* in the condensing-chamber, while its straight flexible portion *a* stands in the upper and flaring portion of the bore *c* in the point-section C. As the stylus moves slightly up and down during the use of the pen, the spiral *b* is slightly flexed or flattened, and is kept continually expanding and contracting to such extent that the fluid held in the spiral duct is kept in a condition of agitation, whereby its flow is facilitated. The same movement slightly flexes the straight portion *a* and causes it to vibrate from side to side to a slight extent in the bore *c*, thereby keeping the duct or passage clear and free from bubbles or sediment.

Within the holder A is an air-tube or vent-duct, G, which extends down from the upper end of the holder, and in the construction shown projects below the lower end thereof and enters the nozzle B. The lower end of this tube almost entirely fills the nozzle, and thereby incloses the condensing-chamber F. The ink-reservoir H is formed by the annular space between the holder A and the tube G. This ink-reservoir communicates with the condensing-chamber through the medium of grooves *d d*, formed in the outside of the tube G, near its lower end, or in the inner walls of the nozzle B, if preferred. Thus the only communication between the condensing-chamber and the ink-reservoir is through the medium of capillary grooves or ducts which prevent any free or rapid flow of ink.

The tube G communicates with the outer air at its upper end. In the construction shown its upper end is cemented into the top of the holder A, and a small hole, *e*, is drilled laterally through both. When the pen is in use, the cap E is slipped onto the head of the holder, as usual, and if pressed fully down will cover and close the vent *e*. In ordinary use, how-

ever, the cap is drawn slightly back, as shown, so that this vent is exposed and the vent or duct through the tube G (which duct I will designate by the letter *g*) is opened to the outer air. The lower end of the tube G is provided with small perforations *f f*, which may communicate with the grooves *d d* or not, as preferred. The lower end of the tube G affords a re-enforcement against which the spring-seating (the spiral *b*) of the stylus bears.

The nozzle-section B is constructed, as heretofore, with a tubular extension or jacket, J, extending down around the point-section C and inclosing a considerable portion of the latter. Within this jacket and around the point section is a partially-inclosed space, I, as in my said Patent No. 291,800. The point-section C has one or more vents, *h h*, consisting of small holes drilled into it, so as to communicate with its bore *c*, and is preferably formed on its exterior with transverse notches *i i*, into which these holes open.

The operation is as follows: When the pen is first filled, it must not be used until the interior surfaces of the holder are thoroughly soaked or saturated with the ink. This is the case with all fountain-pens of this character. When the reservoir becomes thoroughly soaked, the action of the pen commences. Ink flows down from the reservoir through the ducts *d d* into the condensing-chamber F, and thence down the stylus D or bore *c* to the writing-point, whence it is discharged upon the paper. This outflow of ink generates a suction within the reservoir, which results in an inflow of air through the ducts *h h*, this air being previously moistened by flowing through the chamber I, the walls of which are covered with a film of ink. The entering air, being thus moistened, readily combines with the ink in the bore *c* and chamber F, forming a fine froth, with which the condensing-chamber eventually becomes filled. This action is facilitated by the agitation of the spring-seating *a b* of the stylus. The froth gradually works itself into the reservoir H, wherein the air in time disengages itself from the fluid and rises to the upper part of the reservoir. In all pens of this class it will occasionally happen that the vents *h h* will become filled with ink, which adheres tenaciously to them and seals them against the admission of air. When this occurs, the suction draws in air at the writing-point or tip of the section C, since the fluid at that point, being agitated by the movement of the stylus, is less tenacious than that which fills the vents above. This inward suction of air at the writing-point prevents the outflow of ink upon the paper, and the pen runs dry. This serious defect of previous pens is entirely obviated by my invention, since when such stoppage occurs the suction is at once relieved by air which enters through the duct *g*, so that the proper downflow of ink to the writing-point is never interrupted. The result is that the pen writes with a smooth and uniform flow,

without drying up or spattering or any other such defect of prior pens.

The smooth metallic surface of the stylus and its spring-seating afford an "irritant" for facilitating the flow of the ink and the movement of the entering air, while the interior of the condensing-chamber, being of vulcanite or similar material, affords an absorbent surface which co-operates with the gravity of the fluid, the two dissimilar surfaces coacting for the regulation of the flow on the principle elucidated in my patent, No. 253,953, dated February 21, 1882.

When the pen is not in use, it is inverted and put in the pocket. On thus inverting it the ink in the reservoir runs down to its head, and that in the condensing-chamber and in the point-section is drawn into the reservoir, the air in the latter, or a portion thereof, escaping through the duct *g*. The ink and air which remain in the condensing-chamber are governed by the irritant surfaces, so that the ink is kept from forming into balls or drops and the air from gathering into globular bubbles, the frothy condition which is desirable in order to render the pen capable again of immediate use being thereby preserved.

The mechanical construction of the pen may be varied or modified in many ways. For example, the condensing-chamber *F*, instead of being formed in the nozzle-section *B*, may be arranged in the holder *A*, or in the tube *G*, or in the point section *C*. The tube *G* may extend to a greater or less height, either opening through the extreme top of the holder or through its side at any point lower down. It is only essential to this tube or duct that it be so located that in no case will it discharge ink, so that it may not become filled or sealed with fluid.

Fig. 7 illustrates a modified construction, wherein the condensing-chamber is formed in the point-section *C*. The screw-shank of this section is made somewhat larger than before, and the lower end of the tube *G* projects into it and nearly fills it, leaving only sufficient space between to serve the purpose of the ducts *d d*, before described. The air-vents *h h* open from the chamber *I* directly into the condensing-chamber *F*. The upper end of the tube *G* passes through the top or head of the holder *A*. In this construction the cap *E* should be perforated in order to admit air to the duct *g*.

Fig. 8 shows a construction in which the condensing-chamber is located higher up within the tube *G*, which is somewhat enlarged at this point. The point-section *C* screws into the lower end of the tube *G*, instead of into the nozzle-section *B*. The condensing-chamber communicates with the reservoir *H* through the medium of minute perforations *d d* through the wall of the tube *G*. The tube *G* extends upward to about half the height of the holder and opens laterally through the wall thereof.

The stylus may be variously modified. Either of the constructions shown in my said Patent No. 291,800 may be adopted. Figs. 9 and 10

illustrate two modified constructions which may be used, if preferred. That shown in Fig. 9 consists of a round needle flattened above into a very thin elastic ribbon and bowed to one side, as shown. That shown in Fig. 10 consists of a round needle with its upper portion flattened, with a quarter twist between the portions *a* and *a'*, and with the upper portion, *j*, twisted, in order to make it rigid and confine the yielding to the flat portions below.

Instead of a stylus-point, a flat pen may be used by those who prefer it, in which case the point-section will be constructed as shown in Fig. 11, where, instead of being simply bored through, it is also formed with a slit, *k*, in a longitudinal plane which communicates with the bore *c*. Fig. 12 shows the flat pen, which consists simply of a flat sheet of gold or other metal or material cut to the shape shown, and either slitted or not, as may be desired.

The ordinary curved pen-nib may be used with a holder constructed according to my invention. Fig. 13 illustrates one such construction. The pen-nib is confined between the nozzle *B* and a plug, *C'*, which in this construction takes the place of the point-section *C* in the construction first described. The plug *C'* is formed with an ink-duct and air-vent, and within it is formed the condensing-chamber *F*. Beneath the pen-nib and in a groove or gutter in the plug *C'* is a metal strip or wire, *l*, which passes through into the condensing-chamber *F*, and is coiled into a spiral, *b*, therein. This strip and spiral have the same functions as the stylus and its spiral in the construction first described. The tube *G* projects into the plug *C'*, nearly filling it, and leaving only a narrow space or duct, *d*, to afford communication between the condensing-chamber and the reservoir *H*. Many other constructions for admitting the use of this holder with a curved pen-nib may be devised without departing from my present invention, and such constructions may involve the features found in any one or more of my fountain-pen patents heretofore granted or applied for.

Instead of making the vent-duct *g* through the tube *G* and the reservoir *H* outside thereof, the position of these parts may be reversed, as shown in Fig. 14. Here the bore of the tube *G* constitutes the reservoir *H*, which communicates with the condensing-chamber *F* through the medium of minute holes *d d*, formed in the closed lower end of the tube. Around the tube *G* is an annular space, which constitutes the air duct *g*, and which extends up to the top or head of the holder and there communicates with the open air through perforations *e e*. The operation is the same as in the construction first described. In order to supply ink to the reservoir, a screw-cap, *K*, is unscrewed from the head of the holder and the ink poured into the tube *G*.

For a very fine or small pen, either a stylus or nib pen, the barrel or nozzle, or both, may be made small toward the point and enlarged toward the head, as indicated in Fig. 15.

I claim as my invention, in a fountain-pen, the following defined features and combinations, substantially as hereinbefore specified, namely:

5 1. A fountain-pen constructed with a condensing-chamber between the reservoir and the writing-point, with a vent for ink and air communicating therewith and opening near the lower end of the pen, and with a vent-
10 duct extending from said chamber upwardly and opening to the outer air.

2. A fountain-pen constructed with a condensing-chamber between the reservoir and the writing-point, with an ink-duct extending
15 thence downwardly to the writing-point, with a vent for ink and air communicating with said chamber and opening near the lower end of the pen, and with a vent duct extending from said chamber upwardly and opening to
20 the outer air.

3. A fountain-pen constructed with a condensing-chamber between the reservoir and the writing-point, with an ink-duct extending thence down to the writing-point, with an irritant in said ink-duct, with a vent for ink and
25 air opening into said ink-duct, and with a vent-duct extending from the condensing-chamber upwardly and opening to the outer air.

30 4. A fountain-pen constructed with a condensing-chamber between the reservoir and the writing-point, with a jacket around said point forming a partially-closed air-chamber, with a vent for ink and air opening into said
35 air-chamber and communicating with said condensing-chamber, with an ink-duct extending from said condensing-chamber downward to the writing-point, and with a vent-duct extending from said condensing-chamber up-
40 wardly and opening to the outer air.

5. A fountain-pen constructed with a con-

densing-chamber between the reservoir and the writing-point, with an ink-duct extending thence down to the writing-point, with ink and air vents communicating with said cham- 45
ber, with a flexible irritant extending through said duct, and with a capillary spiral in said condensing-chamber.

6. A stylus fountain-pen constructed with a condensing-chamber between the reservoir and the writing-point, with an ink-duct extending from said chamber down to the writing-point, and with a stylus extending through said duct and formed at its upper portion with a flat flexible spiral arranged in the condensing- 55
chamber.

7. The combination, in a fountain-pen, of a holder, a nozzle screwed to the lower end of said holder, a vent-tube extending through said holder, with its lower end entering the 60
upper part of said nozzle and entirely filling the same with the exception of a capillary space or conduit, and a point-section fastened in the lower end of said nozzle, whereby a condensing-chamber is formed in said nozzle be- 65
tween the ends of said vent-tube and point-section.

8. The combination, in a fountain-pen, of a tubular holder, a nozzle screwed to the lower end thereof and formed at its lower end with 70
a projecting jacket, a point-section fastened to said nozzle within said projecting jacket, and a tube extending through said holder with its lower end entering said nozzle.

In witness whereof I have hereunto signed 75
my name in the present of two subscribing witnesses.

WILLIAM W. STEWART.

Witnesses:

ARTHUR C. FRASER,
GEORGE H. FRASER.