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**PROVISIONAL SPECIFICATION.**

**Improvements in Fountain Pens.**

I, ALEXANDER MUNRO, of No. 117, Birchfield Road, Handsworth, Birmingham, Inventor, do hereby declare the nature of this invention to be as follows:—

The object of this invention is to prevent fountain pens from blotting and flooding whilst writing, & also from leaking so readily when the pen is carried in the pocket. The invention may be used in conjunction with any usual device for sealing up the reservoir when the pen is carried in the pocket, but the effect of the invention tends so much in the direction of greater cleanliness that any sealing up device is rendered largely unnecessary.

The main cause of the blotting, flooding & leaking of fountain pens is that the air in the reservoir gets expanded by heat, thus ejecting the ink lying in the air ducts or lying at or near the writing point. I therefore by means of a stop or valve divide the reservoir into two parts, the lower part being usually the smaller part, say a quarter or a third of the whole reservoir. When in course of writing the ink in the lower part of the reservoir is exhausted, the stop or valve is lifted by any suitable means, allowing the ink in the upper part of the reservoir to flow down & fill the lower part. The stop or valve is then closed and writing is resumed. This course is followed until all the ink in the reservoir is exhausted.

By thus reducing the size of the reservoir actually in communication with the nib or writing point, the quantity of air in the reservoir which may expand by heat is greatly reduced, and blotting, flooding, & leaking practically disappear.

The stop or valve is preferably operated by means of a rod extending up to and through the upper end of the barrel of the pen. The rod ends in a small head or button outside the barrel.

I provide means by which the stop or valve may be moved up and down for a small distance, say a quarter of an inch. These means are helpful in allowing the reservoir to be filled more quickly, and also in allowing ink to flow more readily from the upper to the lower part of the reservoir when the stop or valve is lifted. In order that the up & down movement of the stop or valve may be performed as quickly as possible, & thus avoid delay in filling the reservoir, the rod may be provided with a quick throw screw where it passes through the upper part of the barrel; but I find it better to provide it with a spring at the upper end of the barrel which automatically throws the rod outwards when it is revolved a quarter turn. In filling the pen, the head or button at the outward end of the rod is rested on the table & by alternately pressing down and raising the barrel of the pen, the stop or valve is quickly moved up & down.

In lieu of using the usual airtight & inktight packing where the rod passes through the upper end of the barrel, I preferably use a small length of india rubber tube, one end of the tube being affixed to the rod and the other end of the tube being affixed to the upper end of the barrel. A perfectly tight joint is thus secured, & which allows the rod to move up & down with great

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freedom for a short distance. The use of the tube in this way is helpful also in that the space within the reservoir is not lessened in the way that happens when a rod with packing is thrust inwards into the reservoir chamber.

Where the invention is applied to a stylographic fountain pen having an airtube leading to the upper end of the barrel, the airtube may be used in lieu of the rod. In such cases, and also in cases of the invention being applied to what are known as safety pens and self filling pens, the variations in the construction of the pens are very numerous & may necessitate other modifications.

Dated the 1st day of May, 1915.

ALEXANDER MUNRO. 10

## COMPLETE SPECIFICATION.

**Improvements in Fountain Pens.**

I, ALEXANDER MUNRO, of No. 117, Birchfield Road, Handsworth, Birmingham, Inventor, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The object of this invention is to prevent fountain pens from blotting and flooding whilst writing, and also from leaking so readily when the pen is carried point downwards in the pocket. The invention may be used in conjunction with any usual device for sealing up the reservoir when the pen is carried in the pocket, but the effect of the invention tends so much in the direction of greater cleanliness that any sealing up device is rendered practically unnecessary for the majority of fountain pen users. The main cause of the blotting, flooding, and leaking of fountain pens is that the air in the reservoir chamber gets expanded by heat, thus ejecting the ink lying in the ducts leading to the writing point or the ink lying at or near the writing point. I therefore divide the reservoir chamber into two parts, and I provide a stop or valve by which when desired a temporary communication is opened between the two parts for the purpose of transferring ink from either of the two parts of the reservoir into the other part. The lower part of the reservoir is usually, from the greater ease in construction, the part communicating with the nib or writing point. This lower part of the reservoir is usually also the smaller part, say of a quarter or third of the whole reservoir. If the pen is of unusually small size, then the lower part may beneficially be increased to half the size of the whole reservoir. I quote these as approximate sizes, although in particular cases other sizes may be used. When, in course of writing, the ink in the lower part gets exhausted, the stop or valve is opened by any suitable means, allowing the ink in the upper part of the reservoir to flow down, or to be forced down, and fill the lower part. The stop or valve is then closed, & writing is resumed. This course is followed until all the ink in the reservoir is exhausted. By thus reducing the size of the reservoir actually in communication with the nib or writing point, the quantity of air in the reservoir which may expand by heat & force out ink is greatly reduced, & blotting, flooding, & leaking practically disappear.

With reference to the accompanying drawings, Fig. 1 shows a fountain pen having a turncock placed at a distance of say from half an inch to an inch from the lower end of the reservoir chamber. The filling & use of such a pen will be obvious from what has already been said. In lieu of the particular shape of handle shown on the turncock, any other suitable shape of handle may be employed. Thus, as being neater & less bulky, a slot might be used in lieu

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of the handle, & the turncock turned by the use of a coin inserted in the slot. The turncock when closed acts as the division between the two parts of the reservoir. Instead of a turncock, a large number of other means may be used to form a division. Some of these other means are shown on the drawings,  
 5 Figs. 2 to 8. I here point out as a difficulty accompanying the use of a division for the purposes stated, that it should be capable of having an opening made in it of comparatively large size, if the ink in one part of the reservoir is to drop through the opening into the other part of the reservoir by the aid of gravitation alone. I find that in the case of a turncock the hole through it  
 0 should be well over  $\frac{3}{16}$ ths of an inch diameter to allow the ink to easily pass, even with the aid of shaking the pen. This means that the pen at the place where the turncock is placed would require to be of larger outside diameter, & some writers would object to the swelling or enlargement of the pen at this place. Other writers, again, do not object to the enlargement, &  
 5 regard it as an advantage. If, on the other hand, the turncock is made of much smaller size so that it will make no enlargement or no considerable enlargement of the barrel of the pen, the smaller passage through the turncock does not readily pass the ink, & suitable means may be employed to force or induce the ink to pass through the smaller passage. The means that may be  
 0 so employed are also large in number. Figs. 2 to 8 show cases where the opening or passage is of comparatively small size, & where the aid of other means is employed to force or induce the ink to pass.

In Fig. 2, a valve (1) is employed to form the division between the two parts of the reservoir chamber. The valve is affixed to the rod (2). The valve is  
 5 pressed home on its seating by turning the knob (3) a quarter or half turn. The outer end of the knob projects beyond the upper end of the barrel. When the knob is unscrewed, it is thrown outwards by means of the spring (4). This causes the valve to come away from its seating for a short distance, say a quarter of an inch. In filling the pen, the nozzle section is unscrewed, &  
 0 the knob is rested on the table. Ink is poured in to fill the lower part (5) of the reservoir, and by alternately pressing down and raising the barrel of the pen, the knob and valve are quickly moved up & down for the quarter inch distance. The quick up & down motion of the valve enables the ink in the part (5) of the reservoir to pass into the part (6) of the reservoir. More ink  
 5 is then poured into the part (5), or ink may be kept being continuously poured in while the valve movement is maintained, until both parts of the reservoir are filled. In writing, after the part (5) is exhausted of ink, the following procedure is taken to refill it. The nozzle is not unscrewed; the knob is  
 0 unscrewed the quarter or half turn, & the spring throws the valve a quarter inch away from its seating. The pen is held point downwards, & the knob is alternately pressed inwards & allowed to spring out again, giving the quick up & down movement to the valve which enables ink to transfer from the part (6) to the part (5) of the reservoir. A few pressures on the knob fills the part (5). It will be found that ink is not forced out at the nib, as might be  
 5 expected. Finally, the knob is pressed inwards & given the part turn which forces the valve home on its seating & retains it there. The pen is then again ready for writing. In lieu of the spring (4), the knob may have a quick throw screw to move it quickly in & out. A small length of soft rubber tube (7) has one end affixed to the rod & its other end affixed to the upper end of the barrel,  
 0 which acts in lieu of the usual airtight & inktight packing for the rod. I find the rubber tube is more efficient than the usual packing, but the packing, of course, offers a variation in construction.

In Fig. 3, a somewhat similar construction is shown to that of Fig. 2, but here the valve faces the other way, & the knob is not turned round but is simply  
 5 pressed inwards. The spring keeps the valve on its seating, except when the knob is pressed inwards. The filling & use of the pen in Fig. 3 is the same as in Fig. 2.

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In Fig. 4, another form of stop or valve is shown. The piston (8) forms the division between the two parts of the reservoir. A groove or grooves (9) are cut in the wall of the reservoir chamber, & when the piston is moved back & forward over the grooves, a communication is opened between the two parts of the reservoir. The pen may be so constructed that the piston is brought to rest at either end of the grooves. When the piston is brought to rest in its normal position, it is sufficiently clear of the grooves to form an airtight & inktight division. In lieu of grooves, the wall of the reservoir chamber may be of larger diameter at this part.

In Fig. 5, it is shown how the rod is utilised to form the usual air duct to the upper end of the barrel, as in the case of a stylographic fountain pen. It is unnecessary to describe it in words, as the drawing in Fig. 5 gives full information with the aid of what has already been said regarding Figs. 2 & 3. In this case, any means may be employed, such as a small screw, to temporarily close the upper end of the air duct during the process of transferring ink from the larger to the smaller part of the reservoir chamber.

In Fig. 6, a construction is shown which is applicable to one variety of self filling pens. In this case, the piston (8) is drawn by means of the knob (3) to the upper end of the reservoir chamber. The projecting head (10) is then screwed a short way into the knob (3), and by means of the rod (11) attached to the projecting head, the small valve (12) is pressed home in its seating within the piston, which closes the opening (13) leading through the piston. The piston is now pressed towards the lower end of the reservoir chamber forming a vacuum behind it, the nib & lower end of the nozzle section are plunged into ink, and the projecting head (10) is unscrewed, which opens the opening (13) through the piston. This in the first place causes the air in the lower part (5) of the reservoir chamber, and latterly it causes ink, to rise & pass through the opening (13) until the upper part (6) of the reservoir chamber becomes filled, partly with air & partly with ink. The lower part (5) of the reservoir chamber also becomes filled with ink. The projecting head (10) is then screwed inwards, & the small valve (12) is thus closed. The pen is then ready for writing. It will be seen that the piston itself forms the division between the two parts of the reservoir chamber, & that by lifting the small valve (12) a communication is opened between the two parts of the reservoir, and then by moving the piston up & down a short way, the ink in the part (6) may be transferred to the part (5) of the reservoir, the pen meantime being held point downwards. I also point out that, in filling the pen, a second draw back or partial draw back of the piston may be employed to completely fill both parts of the reservoir with ink. For the second draw of the piston, the pen is held point upwards, the projecting head (10) is kept unscrewed, & the piston is drawn back until any remaining air in the rear of the piston is expelled to that part of the reservoir chamber in front of the piston. When that is done, the projecting head (10) is screwed in, and the piston is moved forward (the pen meantime being kept point upwards) until it is seen that ink and not air begins to be ejected at the nib. If now the nib end of the pen is immersed in ink and the projecting head (10) is unscrewed, which opens the opening (13) through the piston, the whole reservoir chamber becomes filled with ink, & no air, or practically no air, is left in the reservoir chamber. In lieu of the valve (12) as shown in Fig. 6, any other suitable form of valve may be used which can be operated by means of the projecting head (10) to close the opening through the piston.

In Fig. 7, the application of my invention to another kind of self filling fountain pen is shown. In this case, it may be more difficult to follow the application of Claim 2 at end of this specification to the construction shown. But following the terms of Claim 2, it will be found to be the case that, firstly, a division (14) is formed between the two parts (5) & (6) of the reservoir. Secondly, an opening (15) is made in the division. Thirdly, the opening may

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be opened or closed by means of the rubber cap (16). Fourthly, the means employed in this case to force the ink from either part of the reservoir to the other part is the use of the rubber bag (17) & tube (15). The description & use of Fig. 7 is as follows. In filling the pen, the sheath (18) is unscrewed & removed, exposing the rubber bag (17), the rubber cap (16) is pulled away from the upper end of the tube (15), the lower half of the nib is immersed in ink & so as to cover the lower opening of the close fitting tube feed (19), it being unnecessary with such a tube feed to immerse the lower end of the nozzle section. With half a dozen pretty rapid compressions & relaxations of the rubber bag, ink will rise & fill the part (6) of the reservoir. The rubber cap (16) is then placed over the upper end of the tube (15), the sheath (18) is screwed on, & the pen is ready for writing. After the part (5) of the reservoir has been emptied of ink in writing, the sheath is taken off, the rubber cap is pulled away from the upper end of the tube, and the rubber bag is compressed rather slowly for a few times on only half of its length, the pen meantime being held point upwards. This operation transfers ink from part (6) of the reservoir to part (5). The rubber cap (16) is replaced on the upper end of the tube, the sheath is replaced, & the pen is again ready for writing.

In lieu of the rubber bag (17) in Fig. 7, a piston with a short length of throw may be employed. In lieu also of the closing of the upper end of the tube in the way shown, the upper end of the rubber bag may be forced down on the upper end of the tube when the sheath is screwed on. Or the tube (15) on any part of its length may be closed by any suitable means which effect the purpose. It will also be seen that from the construction shown in Fig. 7, the screw (20) may be unscrewed for the purpose of filling the part (6) of the reservoir by means of a glass filler in the ordinary way. As a variation in construction where a rubber bag is used, a short knob may be attached to the upper end of the rubber bag, & the knob projecting through & beyond the upper end of the pen, the user of the pen may fill the pen and may replenish the smaller of the two parts of the reservoir from the larger part by revolving the knob without unscrewing the sheath.

In Fig. 8, another way is shown by which the ink may be forced or induced to pass from one part of the reservoir to another. The means here employed is a vigorous shake of the pen, together with the special construction required in this case. The ink has great difficulty in passing through a restricted passage, especially when there may be a partial vacuum behind it. I therefore in this instance make the opening between the two parts of the reservoir as large as possible, as the shaking of the pen is the least effective of the ways described. Fig. 8 shows the construction of a fountain pen which is filled in the usual way by unscrewing the nozzle section. Supposing the part (6) of the reservoir to contain ink, & that the part (5) has been exhausted of ink by writing, then screw in the knob (3), which carries the valve (1) off its seating and causes the valve (21) to close. Then hold the pen point downwards while it is shaken in order to transfer ink from part (6) of the reservoir to part (5). It will be seen that it is necessary in this case that the valve (21) should be closed before the pen is shaken, otherwise ink will be shaken out at the nib. Then unscrew the knob (3) so that the valve (1) will close on its seating, & the pen is again ready for writing.

The drawings do not show the caps used to cover the ends of the pens. In forming the divisions between the two parts of the reservoir, it is necessary that the valves or pistons, &c., used should be airtight & inktight to be thoroughly effective. The pistons on the drawings show no packing, but packing is to be understood. The form also of the pistons is to be taken as illustrative. India rubber may advantageously be used as a facing for the valves.

The various kinds of pens shown in drawings may, in several cases, have parts interchanged with those shown for other pens in the drawings. Further,

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the particular means shown do not exhaust all the like means that may be used. I particularly point this out, as the merit of the invention consists more in the wire selection and combination of means that comply with the broad feature of making a division between the parts of the reservoir, as stated at the beginning of this specification, rather than in anything new in the parts themselves. I believe that had the broad feature referred to been known to former inventors, they would long ago have produced a fountain pen not liable to blot or flood to any observable extent, not even when the reservoir is nearly exhausted of ink. I am quite satisfied that that satisfactory result is now attained by this invention. As the same result had never before been attained, this invention is of special importance. It will, perhaps, be of use if I give a concrete example of how the broad feature applies in the case of one of the pens described. I therefore take the comparatively simple case of the pen described in Fig. 3 on the drawings. It is likely that an ordinary skilled mechanic or engineer would at first sight fail to see how this pen would not blot or flood, because the feed & nib are as in former fountain pens & there is the same open supply of ink to the nib. The explanation is this. Ink practically does not expand with heat, while air expands very considerably. An ordinary fountain pen of similar size would contain a quantity of air (when nearly empty of ink) which with the heat of the hand would expand to say equivalent to expel 8 drops of ink. Of the 8 drops, 3 might be retained on the nib, & 5 would fall on the paper. In the case of the pen shown on Fig. 3, there is the same quantity of air in the pen to be expanded, but the air in the upper part of the reservoir (say equivalent to produce 6 drops of ink by its expansion) is put out of count & cannot expand. The air in the lower part of the reservoir will expand & expel 2 drops of ink, but as the nib is able to retain 3 drops of ink, there is no ink to fall on the paper. There is, therefore no blotting, & the user of the pen practically observes no flooding.

A further pitfall in the way of understanding the pen shown in Fig. 3 is as follows. It would appear at first sight that when the pen is held point downwards, & the knob at the upper end of the pen is pressed inwards, there would be an ejection of ink from the nib. But there is no ejection of ink from the nib, as already stated, unless indeed the knob is pressed with extreme quickness. On the other hand, if the pen in Fig. 7. were placed in similar position, with the rubber cap (16) lifted off the end of the tube & the rubber bag compressed, (this operation being apparently the equivalent of what was done to the Fig. 3 pen) then there would be an ejection of ink from the nib of that pen however slowly the operation be performed. The explanation of the different results is clear to my mind, but is not easy to explain shortly, and, if explained, it is likely that most persons would desire to see the experiments actually performed. This particular instance is by no means the most difficult to explain, some of the other pens presenting unusual difficulty in this respect. Nor can I see that any good result would accrue from my attempting to give a long, & what in some cases would be a doubtful, explanation of these difficulties. It seems needful, however, that I should point out the existence of the special difficulties. What I have done, therefore, is to show the actual construction, & simply state the results, of pens built in compliance with the broad feature of dividing the reservoir into two parts & yet maintaining a correct construction in dealing with the further separate features of each kind of fountain pen. Many former fountain pens had the reservoir divided, or had separate chambers, but I have not seen the drawing of any former fountain pen that would be likely to be a non-blotting pen, or which complies with the conditions I lay down in my Claims 1, 2, & 3 afterwards stated. These former pens appear to have invariably gone wrong in dealing with one or more of the constructional necessities as stated in Claims 1, 2, & 3.

I point out that the expression I have used of dividing the reservoir amounts constructionally to the same thing as forming two separate reservoirs.

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For the purpose of my invention, it is essential that the pen should be so constructed that ink may be transferred in some considerable quantity from the larger or upper part of the reservoir to the other part; it is also essential that this transfer should be effected when the pen is not engaged in writing.

5 It is also essential with my invention that the valve or stop or opening between the two parts of the reservoir should be kept shut during writing if the pen is not to blot. The fountain pens of the former Specifications No. 459/1904, No. 10,070/1885, and No. 23,550/1899, are instances where these required essentials are not supplied, & these former fountain pens therefore do not form  
10 any anticipation of my invention.

The fountain pen of the former Specification No. 924/1897 does not use the principle of the partial vacuum to support & retain the ink within the pen, which principle is generally employed in fountain pens & is also employed  
15 in the case of all the pens containing my invention as shown on the annexed drawing. The former fountain pen referred to so far resembles my invention that it possesses an upper reservoir & what may be described as a lower reservoir, with an intervening division with an opening, together with means by the aid of which ink may readily be forced or be induced to pass through the opening. I point out that the former fountain pen contains also (what my  
20 invention does not contain) a further valve intervening between the lower reservoir and the nib. The presence of that further valve forms a most important difference. The further valve has a most deleterious influence on the efficiency & usefulness of the pen, as it deprives the pen of the usual advantage of a continuous & automatic supply of ink to the nib during writing.

25 Having now particularly described & ascertained the nature of my said invention, & in what manner the same is to be performed, I declare that what I claim is:—

Claim 1. In a fountain pen using the principle of the partial vacuum, a reservoir chamber divided into two parts by any suitable division, such division  
30 capable of being opened, means provided by which the opening may be opened or shut by the user of the pen when desired, & which opening is of a size large enough to allow ink to readily fall or pass, when the pen is not engaged in writing, through the opening by the aid of gravitation from either part of the reservoir chamber to the other part, as & for the purposes set forth.

35 Claim 2. In a fountain pen using the principle of the partial vacuum, a reservoir chamber divided into two parts by means of any suitable division, such division having an opening of smaller size than that specified in Claim 1, means provided by which the opening may be opened or shut by the user of the pen when desired, together with the employment of such means as those  
40 already described or other like means by the aid of which ink may readily be forced or be induced to pass, when the pen is not engaged in writing, through the smaller sized opening from either part of the reservoir chamber to the other part, as & for the purposes set forth.

45 Claim 3. A fountain pen as claimed in Claim 2, but in which the ink can only be passed from the upper or larger part of the reservoir chamber to the other part & not *vice versa*, as & for the purposes set forth.

Claim 4. In a fountain pen, the arrangement, construction, & combination of parts substantially as herein set forth & illustrated in Figs. 1, 2, 3, 5, 6, 7 & 8 of the annexed drawing.

50 Dated this 2nd day of November, 1915.

ALEXANDER MUNRO.

[This Drawing is a reproduction of the Original on a reduced scale.]

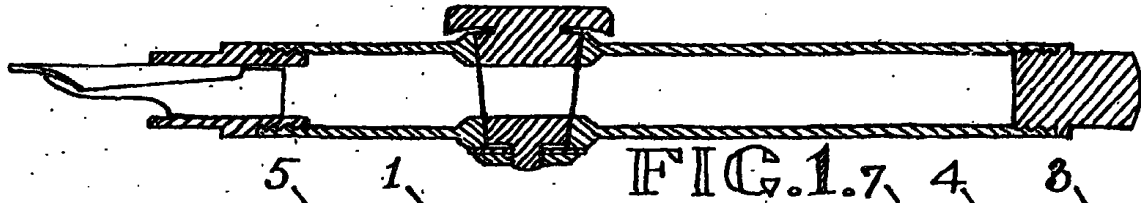


FIG. 1.

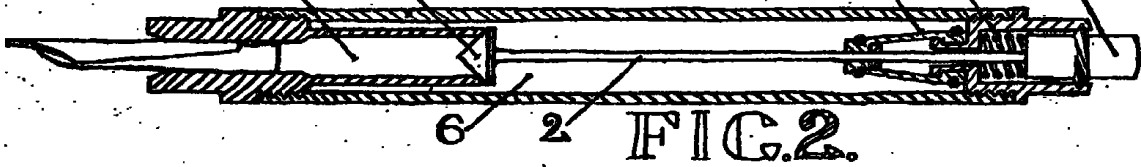


FIG. 2.

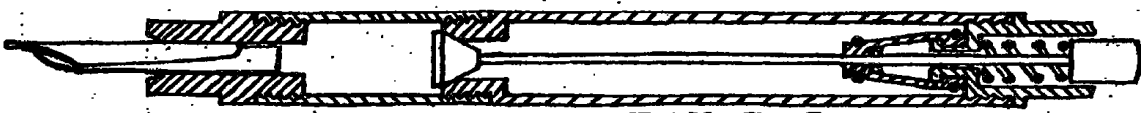


FIG. 3.

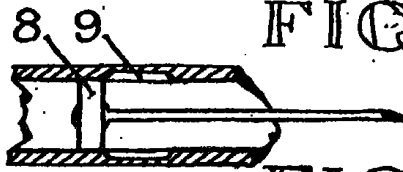


FIG. 4.

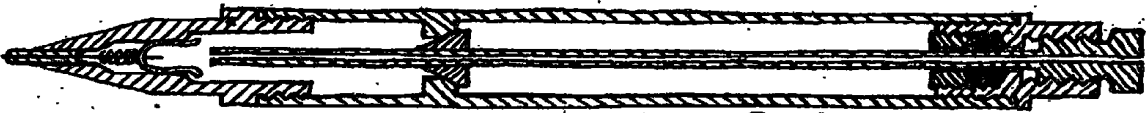


FIG. 5.

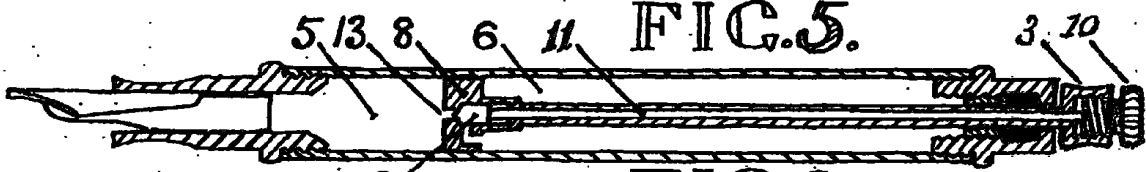


FIG. 6.

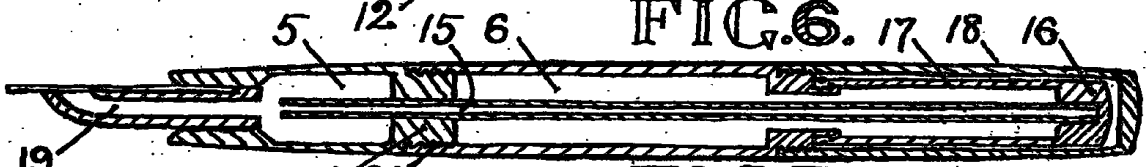


FIG. 7.

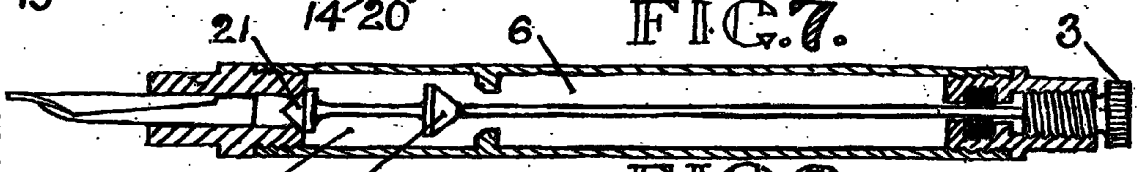


FIG. 8.