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PROVISIONAL SPECIFICATION.

Improvements in Reservoir Pens.

I, ALEXANDER MUNRO, of No. 49, Witton Road, Aston Manor, Birmingham, Inventor, do hereby declare the nature of this invention to be as follows:—

This invention relates to that class of fountain pen which for the purpose of being rendered self filling is provided with an india rubber bulb, or other means in lieu thereof, affixed to the upper end of the barrel, and a tube leading from the upper part of the reservoir chamber to near the nib point. This class of pen has very few representatives among former patents, and the principle on which it works is little known. I have usually found that engineers and others experience difficulty in understanding the action of such a pen, and that they are puzzled by it even after its operation in filling and the individual parts of the pen have been examined by them. Some idea of the difficulty experienced in understanding its action is suggested by the statement that while the pen acts after the manner of a true pump in filling by successive pulsations, yet it contains no valve as is usually present in a pump. It will therefore be convenient, as a ready way of obtaining information as to the principle and action of this class of self filling pen, if I make reference to my former Patent No. 20,065 of year 1907, which contains descriptions and drawings of pens of this class. I think it is much more necessary than usually is the case that the principle or theory of the filling should first be understood by anyone who has anything to do with a fountain pen of this class, as the pitfalls and curious points that are met with are very abundant and troublesome. With other classes of pen, it is usually a comparatively easy matter to transfer a particular part or principle of construction from one class of pen to another, but with this class of pen the difficulties of such a course are very great. It has been difficult for me, on the one hand, to get to know the principles which should guide the construction as regards the filling, and, on the other hand, it has also been difficult to pick out those forms of construction suitable for writing (adapting or modifying them where necessary), so that satisfactory results may be obtained both for filling and writing.

In this specification I shall have occasion to mention some further curious or distinctive points regarding this method of self filling, not hitherto pointed out I believe in any publication, and, in order that my description of the improvements contained in this invention may be intelligible, I shall have to deal very largely with the principle or theory of the filling.

In my former Patent, No. 20,065 of year 1907, I mentioned the curious or distinctive points that a pen of this class might be cleanly in filling both for fingers and penholder, and that it gave an indication when it became full. I may here also mention the further point that it holds a very large supply of ink. These three points or qualities in a self filling pen are of such importance that any simple modification of any existing pen that provides any one of them for the first time, should form good subject matter for a patent, while a simple modification if it stood alone without adding such a quality to the pen, would properly be of no account.

[*Price 8d.*]

Munro's Improvements in Reservoir Pens.

Where a fountain pen has a rubber bulb or small piston arrangement or other means at its upper end whereby the extent of the reservoir chamber can suddenly be reduced, the filling is of course most effective when there is no other exit from the reservoir chamber except by the tube leading from the upper part of the reservoir chamber to near the nib point. (I afterwards refer to this tube as the air tube, as it is convenient to use it as the way by which air can find entrance to the reservoir when writing). For the purpose of writing, however, there must be an opening from the lower part of the reservoir chamber, and by which ink can be led to the nib point, and such an opening must necessarily render the filling somewhat less effective. According to the way in which this opening is made, and according to its size, so is the effect produced in lessening the filling efficiency. A comparatively large size of hole made in one way will not appreciably reduce the filling efficiency, whereas a much smaller size of hole made in another way will impair it altogether. Let it be supposed that a small hole is made leading away from the lower part of the reservoir chamber. In the first case, let it lead by a small tube to near the nib point, and the filling efficiency is practically unaffected, and it fills nicely and with cleanliness in five or six compressions of the rubber bulb when the nib point is submerged in ink, the lower end of the small tube together with the lower end of the comparatively larger air tube both being also submerged in ink in consequence of their proximity to the nib point. In the second case let a slit tube, or let a duct or groove cut in the material lying alongside either side of the nib, and not very accurately fitted thereto, lead to near the nib point from the small hole referred to. In this case, there is a great facility in the sucking up process for air to find its way into the reservoir by the slit in the tube, or by the more or less open space between the nib and adjacent material (which corresponds to the slit in the tube), and when the nib point is placed in ink as before, for the purpose of filling, it is found that the reservoir does not fill with ink, or it fills so tediously and imperfectly, improving as the slit in the tube is reduced to vanishing point, that the construction is a failure. However, let the nib point be submerged deeper in ink until the nozzle of the penholder is submerged, and the filling becomes nearly as efficient as in the first case, but at the expense of cleanliness, as the nozzle is necessarily soiled with ink. In the third case let the small hole, as referred to already, be made from the lower part of the reservoir chamber straight through the wall of the chamber and open to the air on the outside of the penholder. The filling operation is again a failure, even when the nozzle is submerged in ink, and it is necessary to immerse the penholder so deeply in ink that the opening of the hole on the outside of the penholder is submerged before the reservoir can be filled. In the fourth case, let the small hole, already referred to, be made, not through the bottom or side of the reservoir chamber, but opening into the air tube. The filling in this fourth case is as efficient, and the cleanliness is as great, as in the first case. Further, let it be noted that in the first and fourth cases mentioned, the small hole referred to, as made from the lower part of the reservoir chamber, may be of a comparatively large size and may even be as large as the bore of the air tube without very seriously impairing the efficiency and quickness of the filling. The diameter of the bore of the air tube is usually a thirty second part of an inch, or greater. The air tube in that part of its length which lies within the reservoir chamber may even be a slit tube without seriously impairing its efficiency for filling. On the other hand, in the second and third cases already mentioned, the small hole leading from the lower part of the reservoir chamber at once destroys the efficiency of the filling if it is a sixty fourth part of an inch in diameter. This is rather a small hole to cause such ill effects, and although there is a smaller size of hole at which a good deal of the filling efficiency and cleanliness is retained, I will not deal with that subject here but leave it until I come to describe the

construction I use. The general deduction to be made from the four cases I have already mentioned, is that any hole, leading away from the lower part of the reservoir for the purpose of supplying ink to the nib in writing, must, before cleanliness in filling is obtainable, either be of an extremely small size and certainly be less than a sixty fourth part of an inch in diameter when a slit tube, or other duct partially or wholly open to the air, is used, or that a hole of a sixty fourth part of an inch in diameter, or any larger size of hole, must be provided with a tube, or be enclosed in some such way that it will not be open to the air in its passage to near the nib point. Accidental leakage about the screw of the nozzle section, when the usual form of nozzle section is used, is of the nature of the third case already mentioned. Leakage towards the cavity of the nozzle is of the nature of the second case already mentioned. If the amount of leakage be expressed in the terms of the leakage produced by a round hole, then it may be said that in order to obtain cleanliness in filling the hole producing the leakage must be of an extremely small size and certainly be less than a sixty fourth part of an inch in diameter.

In this specification I describe, among other things, how certain types of inkfeed already in use may be used or modified so as to retain the quality of cleanliness in filling when employed in this class of self filling pen. Some people may prefer that type of inkfeed to which they have been accustomed, and an alternative mode of construction in a self filling pen is thus afforded in addition to the construction employed according to my Patent No. 20,065 of year 1907.

Where a plug form of inkfeed is used, that is, a feed having a grooved channel on that side of the plug that lies against the under side of the nib, a tube extends from the upper end of the grooved channel to the upper part of the reservoir chamber, thus providing an air tube. The arrangement is effective if the tube is somewhat loosely fitted into the grooved channel, as it is seen from the fourth case already mentioned that the opening into the air tube may be of some size. The plug feed as usually made is circular in section at its upper end, and the nib is held in place between the plug and the inner wall of the nozzle of the penholder. It necessarily occurs that small open spaces are left along the edges of both sides of the nib where it lies on the plug, and these spaces in effect form two holes leading from the reservoir to the open air. These holes are extremely small, being only the thickness of the nib, or say one quarter of a sixty fourth part of an inch in thickness, but they are large enough to be fatal to cleanliness in filling, as they require the nozzle of the penholder to be submerged in ink before the reservoir can be filled. A different and a satisfactory result, however, is obtained if these holes are filled up. We see from our second and third cases already mentioned that only an extremely small hole or leakage can be allowed at this point. Practically, I find that a sufficiently good result is obtained by turning a small portion of the upper end of the plug of a slightly larger diameter and slightly eccentric to the rest of the plug. In this slightly enlarged part of the plug I then cut away sufficient to let the nib sink in flush with the circumference of the plug at that particular part, so that the plug and nib together fit nicely into the hole in the nozzle of the pen. I have already mentioned that the leakage at this critical spot should be much less than that caused by a round hole of a sixty fourth part of an inch in diameter.

How much less it may be, and still work satisfactorily, I do not determine, but the workman soon finds out for himself what he can safely afford as leakage, and can obtain good results by this mode of construction, or by other similar modes of construction which ensure good fitting, when once he knows the principle to be attended to. He may, for instance, heat the vulcanite plug and press it together with the nib into a round hole to make a good fit, or he may fit a soft rubber ring into the hole in the nozzle of the penholder.

It is a curious result to find that the accurate fitting of the plug allows of the pen being filled with cleanliness and without the necessity of submerging the nozzle in ink, as in the ordinary fountain pen it is rather an advantage that the fitting should not be accurate.

I will now deal with one of the forms of construction where it is desired to supply ink in writing by means of a flexible gold or vulcanite slip lying along the back of the nib and leading in the usual way to near the nib point. By the second and third cases already mentioned, we see that as a slip placed along the back of the nib will cause small open spaces or holes to occur along the edges of the sides of the slip, these holes are fatal to cleanliness in filling. The remedy will now appear obvious, namely, that these holes should be filled up and a good fit obtained. The slip may be embedded in a depression or broad trench formed either in the nib or in the inside wall of the nozzle of the penholder. The latter course is the easier of these two courses. On the soft rubber ring, already referred to as being used inside the hole in the nozzle of the penholder, may be employed as a way to obtain a good fit and in order to do away with the objectionable small holes referred to. I will mention, for guidance, that in the case where the trench for the slip is formed in the vulcanite nozzle of the penholder, it is needful that the slip should not too exactly fill the trench or a supply of ink to the nib point is not given. On the other hand, the slip should not fit in too loosely in case an objectionable small hole is formed and the filling ceases to be cleanly. Here again the workman soon recognised the limits within which he can work. I may add that I have made fountain pens in this way, which are excellent for writing and cleanly in filling.

The inkfeed by way of a slip lying along the back of the nib may be used in conjunction with a plug feed fitted as already described, and in this case with or without grooves in the channel of the plug feed, or it may be used in conjunction with an air tube of the simpler form as described in the following. Here I use a plug with a hole running longitudinally within its substance and opening against the under side of the nib near the nib point. In the upper opening of the hole is affixed a tube extending to the upper part of the reservoir chamber. The plug should be accurately fitted after the manner described with the plug feed already mentioned. Instead of the slip lying along the back of the nib, it may, with such a plug, lie under the nib, or a slip on each side of the nib may be used. Also, with such a plug, instead of a slip under the nib, there is here opportunity to use a small groove cut into the plug and leading to near the nib point. If the fitting of the plug against the nib is accurate, there is no objection to a slit being made from the groove into the hole in the plug. As the air tube in these cases, serves, during writing, the main purpose of admitting air to the reservoir, it is immaterial for this purpose whether the upper tube is tightly or loosely fitted into the hole in the plug. Should longitudinal grooves be cut in the air tube it then becomes a feed tube also, and as such it may either be used alone as pointed out in my former Patent No. 20,065 of year 1907, or in conjunction with any inkfeed to either side of the nib, or in conjunction with inkfeeds to both sides of the nib. I may say that the air tube without grooves acts to some extent as a feed tube, but as a feed tube it is very uncertain and unsatisfactory when used without other aid.

The construction already described requires no separate nozzle section screwing on to the barrel, I find it extremely convenient, however, to use what I call an extension nozzle tube, into which is fitted the plug, nib, and other appertaining parts. The extension nozzle tube is then placed within the nozzle of the barrel, a ledge preventing the tube from going further in than about three sixteenths of an inch. From the nozzle of the barrel it extends downwards, and encloses more or less of the body of the nib as may be desired. It possesses several advantages. It supports and strengthens the

usually small and delicate gold nib commonly used in fountain pens, and allows of a smaller nib being used than otherwise would be possible. It provides, when two sides of the contained plug or plug feed are cut away, a large space where excess ink can find temporary accommodation until it is used up in the course of writing. For the purposes of a self filling pen of this type, it has special advantages, among which is the fact that it allows of the fitting being readily made and inspected. It is not necessary that any part of the nozzle extension tube should be immersed in ink while filling. After much wear and tear of the pen, however, it is possible that the fitting may loosen and that then it may be necessary to immerse the lower end of the nozzle extension tube in ink when filling. In this event, its smaller size and lower position keep the fingers well away from it, and, after filling, the pen may be used for writing without the inconvenience of wiping it dry. When used in this way, it will be seen that according to the general deduction already mentioned it forms a tube not open to the air in its passage to near the nib point. The nozzle extension tube may have a short tongue extending downwards over the back of the nib.

I preferably construct the rubber bulb with a thickened edge at the lower end. The rubber is slipped over the upper end of the barrel, and the thickened edge takes into a circular groove in the barrel. A metal or other ring is then slipped over the rubber to hold it firmly in place. This affords a convenient way by which the user of the pen can easily insert a new rubber when required.

The plug or the plug feed already mentioned may be formed of india rubber in place of vulcanite.

The tube already mentioned as being fitted into the upper end of the grooved channel in the plug inkfeed may be extended downward through the grooved channel to near the nib point, and in this case the grooves in the channel may or may not be formed.

Where I have already mentioned a small hole of a sixty fourth part of an inch in diameter, or even a much smaller hole, producing ill effects, it should be understood that I have mentioned this particular size more as a guide than otherwise, as the length of the hole, its flattened shape, and several other circumstances, produce many differing results.

With particular reference to the first case in the four illustrative cases I have before mentioned, it will be seen that this first case presents great theoretical advantages from the point of view of the filling of the reservoir with cleanliness and efficiency.

Fountain pens have already been described in former patents which have a small tube leading to near the nib point by which ink is supplied to the nib in writing, and they also possess a separate air hole for the admission of air. To adapt the inkfeeds in such pens, or in such of them as are suitable, for use in a self filling pen according to this invention, I therefore attach a tube to the inner end of the air hole and extending to the upper part of the reservoir chamber, and, if it has not already been done, I extend the air hole downwards by means of a tube to near the nib point. Practically, this means that one length of air tube may extend all the way. A rubber bulb or other means in lieu thereof, also requires of course to be affixed to the upper end of the barrel, and there should be no leakage. If the fitting is not otherwise made inktight, undue leakage may be prevented by passing the air tube and separate ink supply tube through holes in an india rubber cylinder which fits into the lower end of the reservoir chamber, or fits the inside of the nozzle extension tube already referred to. If the ink supply tube is made small and of flattened shape, two supply tubes may be used, one above and one under the nib.

The suitability of the nozzle extension tube for a pen of this description is here again shown by the circumstance that an ink supply tube may be formed as a hole made longitudinally within the wall of the tube adjoining the back

of the nib. A tongue prolonged from the nozzle extension tube carries the ink supply tube nearer to the nib point. A slip placed within the ink supply tube may then extend still further downward on the back of the nib to almost the nib point, and allows of the nib readily bending for the purpose of writing.

Dated this 15th day of July, 1909.

ALEXANDER MUNRO.

COMPLETE SPECIFICATION.

Improvements in Reservoir Pens.

I, ALEXANDER MUNRO, of No. 49, Witton Road, Aston Manor, 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 invention relates to that particular class of fountain or reservoir pen which for the purpose of being rendered self filling is provided with an india rubber bulb or other means, such as a piston, in lieu thereof, affixed to the upper end of the barrel, and a tube leading from the upper part of the reservoir chamber and terminating at the lower end of the penholder in a greater or lesser proximity to the nib point.

According to this invention I show how certain types of inkfeed already in use in non-self filling fountain pens or which may have been used in self filling fountain pens uncleanly in filling may be adapted or modified to allow of their use in a self filling pen and yet so as to retain the quality of cleanliness in filling the reservoir. I also show how the rubber bulb may be attached to the upper end of the barrel in an easier and improved way.

Fountain pens of this class are usually puzzling and difficult to understand, and I would make reference to my former Patent, No. 20,065 of year 1907, as a ready way of obtaining information as to the principle and the mode of action in filling the reservoir. Although this principle of filling has long been known (in proof of this, I cite Patents No. 15,492 of year 1884, No. 11,332 of year 1886, and No. 13,133 of year 1902), yet no self filling fountain pen acting on the principle has been produced which is cleanly in filling, with the exception of those self filling pens described as cleanly in filling in my former Patents No. 20,065 of year 1907, No. 21,631 of year 1908, and in this specification. In these two former patents where self filling pens cleanly in filling are described, this result may be said to be due to the use of the special inkfeeds there described. In the invention contained in this specification I show how inkfeeds already in use may be altered or modified so as to produce the same satisfactory result of cleanliness in filling, thus allowing of an alternative construction and allowing the use of existing inkfeeds. Although the amount of invention required to make the somewhat slight alteration needed may appear, now that it has been successfully done and the principle explained, as very simple and obvious and such as in other circumstances might not be sufficient to form good subject matter for a patent, yet I claim that it does so in this case because of the long period during which the slight alteration required was not made, and because of the peculiar difficulty surrounding the matter. I have found it tedious and difficult for me to get to know the principles which should guide the construction as regards the filling, while at the same time paying attention to the writing qualities of the pen. I believe I am correct in stating that beyond those self filling pens described as cleanly in filling in this specification and in my two former patents already referred

to, no other self filling pen acting on any principle of filling has yet been produced which is both cleanly in filling and able to write reasonably well when the flow of ink in writing depends on the gravitational principle usually employed in fountain pens. By cleanliness in filling I refer to the nib being plunged in ink only to the extent of its lower or pointed part, and to the vulcanite nozzle of the penholder being kept well above and clear of the ink in the process of filling so that neither the fingers nor penholder get soiled with ink. A fountain pen cleanly in filling has been a long felt want, and the advantage of such a pen to a fountain pen user is very great.

It happens as regards the quality of cleanliness in filling that there is a very close relationship between the theoretical idea by way of which I attain it in my two former patents already referred to and the way by which I attain the same result in this invention. In the former patents the cleanliness in filling may be said to depend on bringing a tube from the upper part of the reservoir chamber to near the writing point of the nib, such tube serving also as a feed tube (*i.e.*, containing within itself the means by which the pen is able to write in a satisfactory way), otherwise the pen would be useless from a writing point of view. In this invention, I in some cases follow a similar procedure; in other cases, the tube referred to may or may not serve also as a feed tube, and another tube (or tubes) leading from the lower part of the reservoir to near the nib point is provided for the purpose of feeding the nib with ink while writing. In all such cases, the tube or tubes above referred to should, theoretically, in order to ensure effectiveness and cleanliness, be genuine tubes and should not merely be split tubes or tubes having side openings or leakages, although, of course, the tubes would be equally effective if built up of parts which permitted of no side opening or leakage thus making them into covered in channels. Further, the theoretical idea of these tubes presumes that there is no other exit from or entrance to the reservoir chamber except through the tubes, and further, it is necessary that the tubes should lead to near the writing point of the nib and should not terminate at the nozzle of the penholder. It is necessary, in filling the reservoir, to insert the lower termination of the tube or tubes in ink, and therefore they should extend below the nozzle and as near to the writing point of the nib as is practicable, so that the nozzle may remain unsoiled with ink when filling. The preceding presents the theory of the tubes or covered in channels, and I deem it necessary to present this in the first place otherwise the practical construction I detail further on will not be understood. I have said above that there should be no other exit from or entrance to the reservoir chamber except through the tube or tubes leading to near the nib point. This is theoretically true, and therefore should always be borne in mind. In some instances I give, the construction depends on a strict compliance with it. In other instances I give, there is an apparent violation of it, and yet self filling pens are produced which are practically effective and cleanly in filling. In the latter instances, it will be found that while an exit or entrance exits which does not lead by a tube to near the nib point, yet its effect is neutralised in actual use by making it in such a way that it becomes blocked with ink and ceases to act deleteriously on the filling. The size and shape and general construction of the exit required to produce this satisfactory result is later on described in a way which the workman can understand and follow. I will first deal with some further theoretical considerations which are instructive, and which are illustrated by Figures 1 to 4 on the annexed drawings. In Figure 1, the air tube (1) extends from the upper part of the reservoir chamber to near the nib point, and it serves to admit air to the reservoir during writing. To fill the pen, the nib (6) is plunged in ink until the lower opening of the air tube (1) is submerged, and then the rubber bulb (3) is quickly compressed and allowed to expand again. This is repeated for a few times until the reservoir becomes full. This can be more readily understood if it be imagined that the reservoir chamber has no

other exit except through the air tube, and the filling is necessarily most effective when there is no other exit. For the purpose of writing, however, there must be an opening from the lower part of the reservoir chamber by which ink can be led to the nib point. In considering the various directions in which an opening can be made, there are to be observed some curious and distinctive points, and which afford guidance. According to the way in which this opening is made and according to its size, so is the effect produced in lessening the filling efficiency. A comparatively large size of hole made in one way will not appreciably reduce the filling efficiency, whereas a much smaller size of hole made in another way will impair it altogether. In Figure 1, let the hole lead by the small tube (4) to near the nib point, and the filling efficiency is practically unaffected, and the reservoir fills nicely and with cleanliness in five or six compressions of the rubber bulb. In Figure 2, let the small hole (4^a) lead from the reservoir to the cavity in the nozzle of the penholder. In this case, there is a great facility in the sucking up process for air to find its way into the reservoir, and when the nib point is placed in ink as before for the purpose of filling, it is found that the reservoir does not fill with ink. However, let the nib be submerged deeper in ink until the nozzle of the penholder is submerged, and the filling becomes nearly as efficient as in Figure 1, but at the expense of cleanliness, as the nozzle is necessarily soiled with ink. If in lieu of the hole (4^a) a slit tube is used, or if a duct or groove is cut in the material lying alongside either side of the nib and not very accurately fitted thereto, the results are similar to those produced by the hole (4^a). In Figure 3, let the small hole (4^b) open to the air on the outside of the penholder. The filling operation is again a failure even when the nozzle is immersed in ink, and it is necessary to immerse the penholder in ink until the hole (4^b) is submerged before the reservoir can be filled. In Figure 4, the small hole (4^c) is made, not through the bottom or side of the reservoir chamber, but opening into the air tube. The filling in this case is as efficient, and the cleanliness is as great as in Figure 1. The diameter of the bore of the air tube is usually a thirty second part of an inch, or greater. Further, let it be noted that in Figures 1 and 4, the small hole referred to may be of some size, and may even be as large as the bore of the air tube without entirely destroying the efficiency of the filling. The air tube in that part of its length which lies within the reservoir chamber may even be slit (the slit edges being brought closely together) without entirely destroying the filling efficiency. On the other hand, in Figures 2 and 3, the small hole at once destroys the efficiency of the filling if it is a sixty fourth part of an inch in diameter. This is rather a small hole to cause such ill effects, and although there is a smaller size of hole at which a good deal of the efficiency and cleanliness is retained, I will not deal with that subject here but leave it until I come to describe the construction I use. The general deduction to be made from the four figures already mentioned, is that any hole leading away from the lower part of the reservoir for the purpose of supplying ink to the nib in writing must, before cleanliness in filling is obtainable, either be of an extremely small size and certainly be less than a sixty fourth part of an inch in diameter when a slit tube or other duct partially or wholly open to the air is used, or that a hole of a sixty fourth part of an inch in diameter, or any larger size of hole, must be provided with a tube or be enclosed in some such way that it will not be open to the air in its passage to near the nib point. Accidental leakage about the screw of the nozzle section, when the usual form of nozzle section is used, is of the nature of Figure 3 already mentioned. Leakage towards the cavity of the nozzle is of the nature of Figure 2 already mentioned. If the amount of leakage be expressed in the terms of the leakage produced by a round hole, then it may be said that in order to obtain cleanliness in filling the hole producing the

leakage must be of an extremely small size and certainly be less than a sixty fourth part of an inch in diameter.

I now come to deal with the actual construction employed.

On the accompanying drawings,

Figures 1 to 4 illustrate the theoretical points already dealt with.

Figures 5 to 7 show a plug inkfeed of the usual type which has been adapted.

Figures 8 and 9 show a plug inkfeed of the type shown in Patent No. 5950 of year 1884, which has been adapted.

Figures 10 to 13 show various forms of inkfeeds adapted, and in which a nozzle extension tube is used.

Figure 14 shows a pen fitted with the same inkfeed as shown in Figures 8 and 9, and shows the improved way in which the rubber bulb is attached to the upper end of the barrel.

Referring to Figures 5 to 7, Figure 5 is a section of the lower part of a pen in which a plug inkfeed (5) of the usual type has been adapted. Figure 6 is a view of the plug alone, and Figure 7 is the same having the nib (6) placed in position over it. Figure 6 shows most clearly the upper end (7) of the plug which is turned of a slightly larger diameter, and eccentric to the remainder of the plug. A little bit of the eccentric part (7) is cut away to allow the nib to sink in flush with the circumference of the plug at that particular part, so that the plug and nib together fit nicely into the hole in the nozzle of the pen, and thus avoid leakage. This is shown clearly in Figure 7. I have already mentioned that the leakage at this critical spot should be much less than that caused by a round hole of a sixty fourth part of an inch in diameter. How much less it may be, and still work satisfactorily it is of no practical importance to determine, and the workman soon finds out for himself what he can safely afford as leakage, and can obtain good results by this mode of construction, or by other similar modes of construction which ensure good fitting when once he knows the principle to be attended to. It is a curious result to find that the accurate fitting of the plug allows of the pen being filled with cleanliness and without the necessity of submerging the nozzle in ink, as in the ordinary fountain pen it is rather an advantage that the fitting should not be accurate. If the nib is not fitted in this accurate way, it necessarily occurs that openings or leakages occur leading from the reservoir. These openings may be extremely small, being only the thickness of the nib, or say one quarter of a sixty fourth part of an inch in thickness, but they are large enough to be fatal to cleanliness in filling. They correspond to the small hole described with reference to Figure 2. In Figure 5, (1) is the air tube leading to the upper part of the reservoir chamber after the manner of the air tube shown in Figure 14, and the pen generally may be fitted up as shown in Figure 14. The air tube is preferably extended to the lower part of the plug inkfeed (5) as shown in Figure 5, but it may be inserted within the upper part only. The arrangement is effective if it is fitted somewhat loosely into the channel of the plug, as it is seen from Figure 4 that the opening into the air tube requires none of the accurate fitting required to guard against the small holes shown in Figures 2 and 3.

Referring to Figures 8 and 9, Figure 8 is a section and Figure 9 is a plan of a plug inkfeed of the type shown in Patent No. 5950 of year 1884, which has been adapted. The air tube (1) fits somewhat loosely into the hole (8) made within the substance of the plug. This hole opens against the under surface of the nib near the nib point by way of the transverse hole (9) and the slit (10). The lower end of the air tube (1) is not blocked, and that side of the air tube which lies against the hole (9) is cut open, so that air has free entrance to the air tube. An eccentric part (7) is turned at the upper end of the plug, to allow of the accurate fitting of the plug at this part. Figure 14 shows an inkfeed of this description in place within the penholder.

Referring to Figures 10 and 11, Figure 11 shows a cross section of Figure 10

along the line A B. For the purpose of feeding ink to the back of the nib during writing, the vulcanite or gold slip (11) is used. By the lesson already given from Figure 2, it is seen that any small holes occurring along the sides of the slip will immediately be fatal to cleanliness in filling. The remedy will now appear pretty obvious, namely, that these holes should be filled up and a good fit obtained. In Figures 10 and 11, the slip (11) is shown as embedded in a depression or broad trench formed to receive it. As in the case of fitting the plugs it is by no means so difficult as it appears, to get that degree of careful fitting which will produce holes that are not too small to allow of ink passing to the nib while writing and that are not so large as to destroy the cleanliness in filling. Here again the workman soon recognises the limits within which he can work. In Figures 10 and 11, the fitting shown below the nib (6) is that of the same plug as in Figures 8, 9, 12 and 14, and which plug also serves to deliver ink to the under surface of the nib in writing, so that in Figure 10 ink is delivered to both sides of the nib in writing. In Figures 10 and 11 the nozzle extension tube (12) is shown as fitting into the nozzle proper (13) of the penholder. It may instead be made to screw in, or the usual screwed point section of the penholder may be used. The nozzle extension tube as shown I find especially convenient when any ink supply to the back of the nib is desired.

Referring to Figure 12, the nozzle extension tube (12) has a small hole (4) made within its substance. A tongue (14) extends downwards from the nozzle extension tube, and this tongue carries the hole (4) nearer to the nib point. A slip (11) placed within the hole may then extend still further downward on the back of the nib to almost the nib point, and allows of the nib readily bending for the purpose of writing. The fittings below the nib are the same as in Figure 10. Following the lesson given from Figure 1, it will be seen that in this case no careful fitting of the slip (11) as in Figure 10 is required to ensure cleanliness in filling, as the lower opening of the tube or hole (4) is itself placed in ink when filling.

Referring to Figure 13, the construction of the slip (11) and tube or hole (4) is the same as in Figure 12. Underneath the nib, however, the air tube (1) is a plain tube which cannot be relied upon to deliver ink to the nib during writing. The air tube (1) in this case serves as an entrance for air during writing, and the hole (4) and slip (11) deliver ink to the nib point. An india rubber washer (15) has two holes through which run the two tubes that lead to near the nib point, thus preventing any leakage and making any further careful fitting of the parts unnecessary so far as cleanliness alone is concerned.

Referring to Figure 14, this shows one of the simplest and most useful forms of construction. The cap is not shown in the drawing. The plug ink-feed (5) is that already described with reference to Figures 8 and 9. The reservoir chamber (16) is hollowed out wider in the middle than at each end in order to admit of the barrel being made in one piece. Instead of this being done, a nozzle extension tube or the usual screwed nozzle section may be used. Figure 14 also illustrates the improved way in which I attach the rubber bulb (3) to the upper end of the barrel. The thickened edge (17) of the rubber is slipped over the upper end of the barrel, and takes into a groove (18) on the end of the barrel. A metal or other ring (19) is then slipped over the rubber to hold it firmly in place. This affords a convenient way by which the user of the pen can easily insert a new rubber when required. The flattened ring (19) used with the thickened edge (17) effects the improvement.

A fountain pen of this class holds a very large quantity of ink.

With the parts already described various combinations may be made beyond those shown in Figures 10 to 13. Thus instead of a slip lying along the back of the nib, it may, in certain cases, lie under the nib, or a slip on both sides of the nib may be used.

The nozzle extension tube may be utilised to allow of a smaller gold nib being used than would otherwise be possible as it may be used to support and strengthen the usually small and delicate nib commonly found in fountain pens. It allows of the fitting being readily made and inspected. It is not meant that any part of the nozzle extension tube or of the nozzle of the pen-holder when there is no nozzle extension tube, should be immersed in ink while filling. After much wear and tear of the pen, however, the fitting may loosen and then it may be necessary to immerse the lower end of the nozzle extension tube in ink while filling. In this event, its smaller size and lower position tend to keep the fingers away from it, and, after filling in such case, the pen may be used for writing, by people who are in a hurry or who are not very particular, without the inconvenience of wiping it dry. I may express my opinion that while pens, made with the plug feed shown in Figures 5, 6, and 7, are cleanly in filling when new, they cannot, owing to the rather frail character of the gold nibs usually employed, be expected to retain the quality of cleanliness to nearly the same extent as when the plug feed shown in Figures 8 and 9 is used. In the latter case, the weakness of the nib does not affect the matter in this particular respect.

Where I have already mentioned a small hole of a sixty fourth part of an inch in diameter, or even a much smaller hole, producing ill effects, it should be understood that I have mentioned this particular size more as a guide than otherwise, as the length of the hole, its flattened shape, and several other circumstances, produce many differing results.

In Figures 12 and 13, the ink supply tubes on the back of the nib may be constructed of flattened instead of round shape. If the ink is led within a suitable distance of the nib point, the slip (11) may be dispensed with.

Where one or more ink supply tubes or slips lead ink to the nib point for writing, it is most important that the lower opening of the air tube should be so near, or otherwise so connected by a capillary channel, to the ink supply tubes, that any excess of ink coming down during writing will fill and block the lower end of the air tube, and thus prevent more ink from coming down until the excess ink has been used up in writing. In Figure 13, for instance, any excess ink coming down the slip (11) is immediately drawn through the slit in the nib and blocks up the air tube (1).

I am aware that plug feeds have been closely fitted into former fountain pens, but I am not aware of any case where a pen of this particular class has been so treated for the purpose of producing a pen cleanly in filling, and I restrict my claims to pens of this class having the air tube leading into the plug feed.

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

1. In a self filling fountain pen of the particular class already referred to, the plug feed shown in Figures 5, 6, and 7, having a portion of its upper end made slightly larger and eccentric to the body of the plug for the purpose of closely fitting the plug into position, or the close fitting of the plug into position in any other suitable manner, and the air tube from the upper part of the reservoir leading to the plug, as and for the purposes set forth.

2. In a self filling fountain pen of the particular class already referred to, the plug feed shown in Figures 8 and 9, having a portion of its upper end made slightly larger and eccentric to the body of the plug for the purpose of closely fitting the plug into position, or the close fitting of the plug into position in any other suitable manner, and the air tube from the upper part of the reservoir leading to the plug feed, as and for the purposes set forth.

3. In a self filling fountain pen of the particular class already referred to,

a plug feed closely fitted into position within a nozzle extension tube, as and for the purposes set forth.

4. In a self filling fountain pen of the particular class already referred to, a tube leading from the upper part of the reservoir chamber to near the nib point, and another tube leading from the lower part of the reservoir chamber also to near the nib point to supply the nib point with ink and the accurate fitting of the parts so that there is practically no opening from the reservoir chamber except through these two tubes, as and for the purposes described.

5. In a self filling fountain pen of the particular class already referred to, a tube leading from the upper part of the reservoir chamber to near the nib point, and a channel leading from the lower part of the reservoir chamber to some distance above the nib point and from thence a slip extending to near the nib point to supply the nib point with ink, the said tube or channel being closely filled up with the said slip, and the accurate fitting of the parts so that there is practically no opening from the reservoir chamber except through the said tube and said channel, as and for the purposes set forth.

6. In a self filling fountain pen of the particular class already referred to and which is provided with any of the plug feeds named in Claims 1 and 2, an india rubber bulb having a thickened edge placed within a circular groove on the upper end of the barrel of the pen, with a metal or other suitable ring slipped over the thickened edge of the rubber, as and for the purposes set forth.

7. In a self filling fountain pen, the arrangement, construction and combination of parts, substantially as herein set forth and illustrated in Figure 14.

Dated the 14th day of January, 1910.

ALEXANDER MUNRO.

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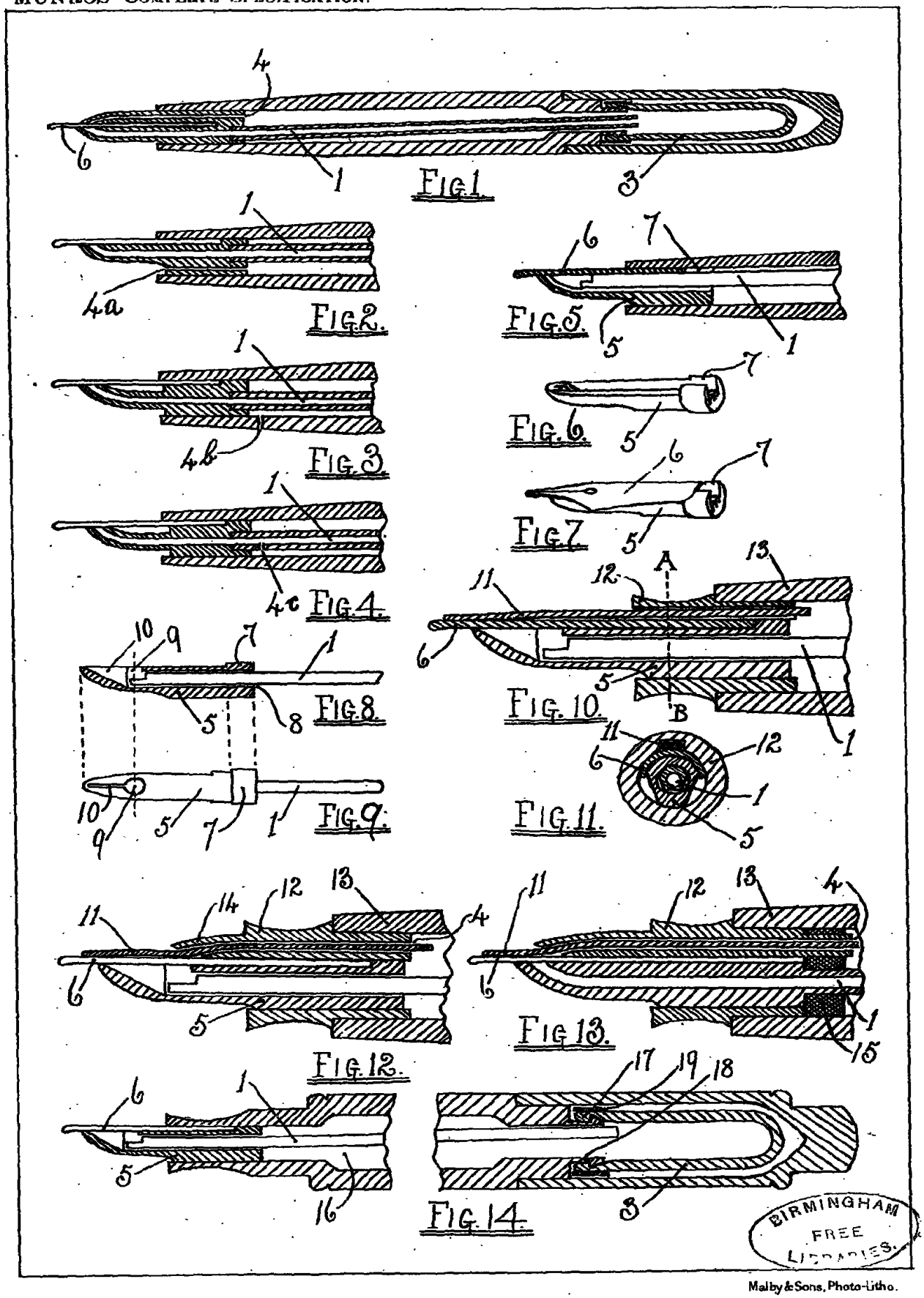

[This Drawing is a reproduction of the Original on a reduced scale.]

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