W. VON BOLTON.

PEN.

APPLICATION FILED JUNE 8, 1907.

930,930. Patented Aug. 10, 1909.

Fig. 1.

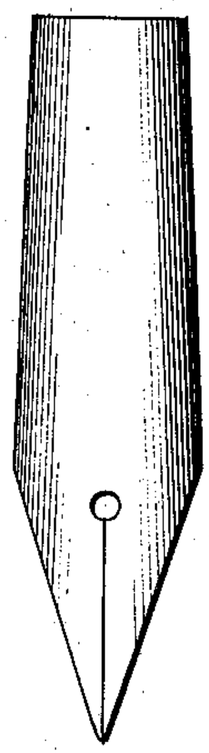
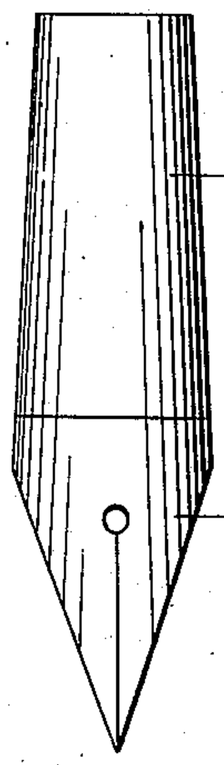


Fig. 2.



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UNITED STATES PATENT OFFICE.

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PEN.

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To all whom it may concern:

Be it known that I, WERNER VON BOLTON, a subject of the Czar of Russia, and resident of Charlottenburg, near Berlin, Germany, have invented a certain new and useful Improvement in Pens, of which the following is a specification.

My present application constitutes divisional application "D" of my original application, filed February 17, 1905, and serially numbered 246,189.

My invention relates to pens, by which I mean to indicate instruments adapted for writing, drawing or analogous uses.

More particularly, the invention comprises a pen in which the nib, or flexible portion, contains tantalum, the shank being formed of any suitable material such as steel or also of course the same material as the nib. The tantalum may be in substantially pure condition or suitably combined with another substance.

Absolutely pure metal is rarely obtainable but all the benefits of absolutely pure metal may be obtained by a metal which is substantially or practically pure, that is, having practically or substantially the same properties as pure metal.

Heretofore such instruments have been made of other materials such as steel, gold or other metals, or of glass, stone or the like. They should be very hard to enable them to resist the tendency to wearing out, but at the same time they should have considerable resilience or flexibility, and also be able to resist the attack of the writing fluids or other detrimental agencies.

According to my present invention, I employ in place of the heretofore used materials, a substance which has the advantages of all the heretofore used substances but lacks their disadvantages. Furthermore it has advantages which none of the materials heretofore employed for similar purposes possess. This material is tantalum, either pure or combined with another substance.

It possesses like steel the property of being easily worked and hardened; and also offers great resistance to fracture and has great flexibility or resilience. Its hardness can be increased to such a degree as to greatly exceed that of the best kinds of steel and even that of the usually employed stones. With regard to the greatest degree of hardness which it can attain it is almost equal to the diamond. It has the further advantage over steel in being one of the precious metals which is not affected by the atmosphere, and which at ordinary temperatures completely resists the action of most acids. All this is of course of great importance in the article forming the subject matter of my invention.

In the accompanying drawing, I have shown by way of example two forms of pens constructed in accordance with my invention.

Figure 1 is a top plan of a pen having its nib and shank composed of the same substance and Fig. 2 shows the form of pen with the nib composed of tantalum and carbon, while the shank is composed of steel.

In order to be able to work the metal properly, it must previously be well fused. By the fusing process the tantalum is freed from impurities and rendered homogeneous. The fusing is best accomplished by means of the electric current in a vacuum. After the metal has been thus melted it can be easily worked mechanically in any known manner. It can be hammered, rolled, drawn, filed and the like, and thereby brought into every desired form. When being mechanically worked, especially if it contains a small quantity of carbon or other hardening medium, the metal readily assumes so great a degree of hardness that further working is rendered impossible and it must then be carefully reheated or annealed in order to be rendered soft again. In this annealing process care must be taken that the temperature does not rise too high as otherwise the metal is more easily attacked by the oxygen of the atmosphere. The metal will however even in the form of the finest drawn wires or thinnest rolled bands, stand a heating in the air up to a dark red heat temperature without being appreciably affected. When so heated the metal shows a coloration similar to tempered steel. In order to prevent too great a heating, especially of fine parts of metallic tantalum, it is preferable to effect the heating indirectly by bringing large plates or drums to the temperature to which the parts to be heated are required to be brought, and then to bring the objects of tantalum into contact with these plates or drums. If on the other hand, it is desired to raise the objects of tantalum to higher temperatures, without being materially affected on their surfaces, it is advantageous to effect the

heating in a vacuum, as at very high temperatures metallic tantalum combines with almost all known substances.

The heating in the vacuum is preferably carried out by electrical means, such as by electrical resistance or directly by passing the electric current through the objects to be heated. For imparting great hardness to the metallic tantalum, other substances can be added thereto. Carbon in particular serves for this purpose, and it acts upon metallic tantalum in a similar manner as upon steel. In addition, however, other substances such as oxygen, hydrogen, silicon, boron, aluminum, titanium and tin can be used. In the case of carbon, the tantalum becomes very hard and resisting, even with the presence of a small fraction of a percent. Also, of the other substances mentioned, even small quantities are sufficient to produce great hardness. If the admixture of such hardening substances is increased materially beyond the said small proportions the metal generally becomes so brittle that no further working of it is possible. The extent of the permissible quantity of carbon or other known substances must be determined in each separate case according to the particular conditions and character of the substances chosen. If, for example, the tantalum is to be drawn into wire, particularly fine wire, or is to be rolled out into very fine bands or springs, the degree of hardness must be so chosen that the metal wire passing through the drawing dies or rolls will not be liable to crack. Especially in the drawing process care must be taken that the drawing does not require an expenditure of force in excess of that which is admissible with relation to its resistance to fracture.

A subsequent hardening of the already worked article of pure tantalum can be effected by heating the metal to redness in carbon in a similar manner to the treatment of steel.

As metallic tantalum is at present very expensive, only those parts need be made of tantalum that are directly subject to wear and exposure, for instance, the writing point or flexible portion of the pens.

For many purposes, in place of pure metallic tantalum, alloys of tantalum can be used which also exhibit good properties, for example, alloys of tantalum with an element of the iron group. The most serviceable alloys of iron are on the one hand those which consist of iron containing only small quantities, up to a small percentage of tantalum, or, on the other hand, those which consist of tantalum having only a small percentage of iron. The properties of these alloys can be varied to a very great extent by changing the proportions of the constituents.

In my present application, I claim specifically pens composed of the described material, the other parts of my invention being protected in applications divided from my original application, filed February 17, 1905, serially numbered 246,189, of which this application is also a division.

I claim:

1. A pen having a nib portion containing tantalum.

2. A pen having a nib portion containing tantalum and a hardening agent.

3. A pen having a nib portion containing tantalum and carbon.

4. A pen having a nib portion composed of hardened tantalum.

5. A pen having a nib portion composed of tantalum and carbon.

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Witnesses:

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