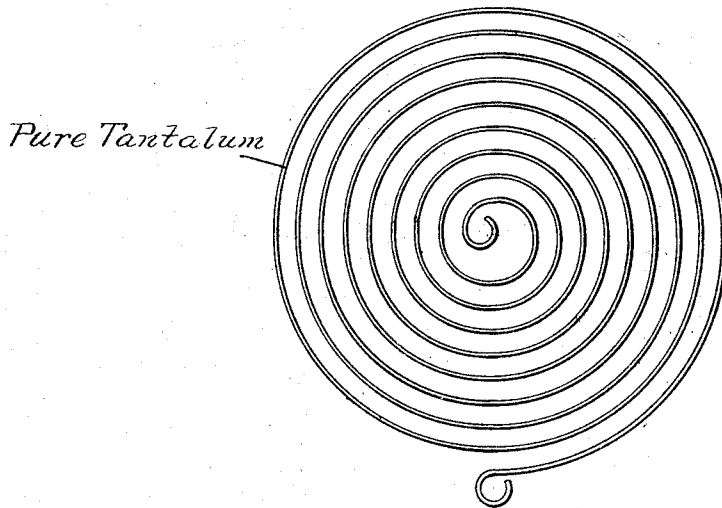


W. VON BOLTON.
SPRING FOR TIMEPIECES.
APPLICATION FILED JUNE 8, 1907.

947,146.

Patented Jan. 18, 1910.



Witnesses:
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UNITED STATES PATENT OFFICE.

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SPRING FOR TIMEPIECES.

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Specification of Letters Patent.

Patented Jan. 18, 1910.

Original application filed February 17, 1905, Serial No. 246,189. Divided and this application filed June 8, 1907. Serial No. 378,023.

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 certain new and useful Improvements in Springs for Timepieces, of which the following is a specification.

My present application is a division of my prior application, filed February 17, 1905, serially numbered 246,189.

The present invention relates to an improved construction of springs, and more particularly to springs which are employed in time pieces.

Heretofore springs of this character have generally been made of steel, due to the fact that that material combines a great many advantageous properties, such as being capable of easy manufacture, considerable strength, resistance to wear, and the like. There are, however, certain inherent objections to the use of steel in springs for time pieces. The material is not permanent under all conditions, and, being susceptible to magnetism, rusting, and wear, it proves unsatisfactory. Before my invention, however, so far as I am aware, no efficient substitute for steel was suggested, and I therefore believe that I am the first to overcome these difficulties and to provide a spring for time pieces which is capable of answering the severe requirements which are demanded. In accordance with my invention, I form the spring of tantalum. Tantalum has been proposed for use in filaments for electric lighting, wherein its high melting point is the chief property utilized. I have found, however, that tantalum possesses a great many properties which were not heretofore utilized, and which are of peculiar advantage in the springs of time pieces. It possesses, like steel, the property of being easily worked and hardened. It offers greater resistance to fracture than steel, and has great resilience and elasticity. Its hardness can be increased to such a degree as to greatly exceed that of the best steel and to be almost equal to the diamond in this respect. It has the further advantage over steel of 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.

A further advantage which it possesses is that it is substantially non-magnetic. Being extremely hard, it offers great resistance to wear, and, being resilient and elastic, while at the same time possessing great strength, it has the yielding property of steel with less liability of fracture. Being non-magnetic and resistant to acids and to the atmosphere, it has a permanence which steel entirely lacks. Having a very high melting point, it is capable of use at temperatures beyond which steel would be of service.

I have illustrated in the accompanying drawing a clock spring composed of tantalum.

In order to work the metal satisfactorily, it must be previously well fused. This is preferably done by heating the metal in a vacuum by electrical means, such as by electrical resistance or directly by passing an electrical current through it. By the fusing process the metal is freed from impurities, while at the same time being rendered homogeneous. The metal which has been fused, and thus rendered homogeneous, can be readily worked mechanically in any known manner. It can be hammered, rolled, drawn, filed and the like, and thus brought into any desired form. When being worked mechanically, 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 heated 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. Even in the form of the finest drawn wires, or the thinnest rolled bands, however, the metal will stand a heating in the open air up to a dark red heat without being appreciably affected. When so heated the metal shows a colorization similar to tempered steel. In order to prevent too great a heat, particularly of fine parts of pure 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 to be heated in contact with these plates or

drums. If, on the other hand, it is desired to raise the objects of tantalum to higher temperatures without their being materially affected on their surfaces, it is advantageous to effect the heating in a vacuum, as at very high temperatures pure tantalum combines with almost all known substances.

I claim:

A spring for timepieces composed of substantially pure tantalum.

WERNER VON BOLTON.

Witnesses:

WOLDEMAR HAUPT,
HENRY HASPER.