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H. C. PARKER & W. G. CLARK.

ART OF MAKING REFRACTORY METALLIC WIRES OR FILAMENTS.

APPLICATION FILED OCT. 14, 1906.

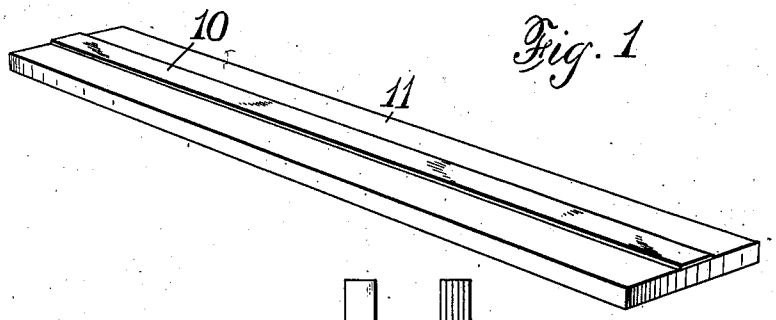
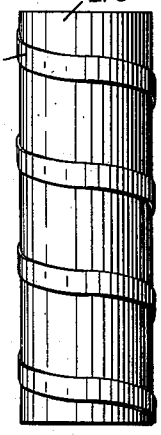


Fig. 1

Fig. 2



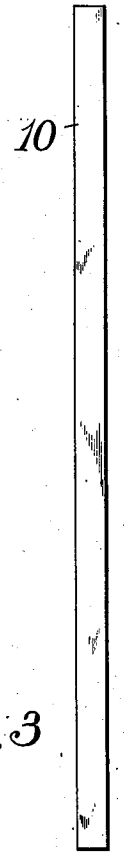


Fig. 3



Fig. 4



Fig. 5



Fig. 6

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ART OF MAKING REFRACTORY METALLIC WIRES OR FILAMENTS.

No. 840,246. Specification of Letters Patent. Patented Jan. 1, 1907.

Application filed October 14, 1905. Serial No. 282,712.

To all whom it may concern:

Be it known that we, HERSCHEL C. PARKER, of New York, county of Kings, and State of New York, and WALTER G. CLARK, of Seattle, county of King, and State of Washington, have invented a new and useful Improvement in the Art of Making Refractory Metallic Wires or Filaments, of which the following is a full, clear, and exact description.

Our invention relates to improvements in the art of obtaining refractory metals, such as iridium, osmium, vanadium, and other refractory metallic substances difficult to produce in the ordinary way in the form of a coherent tape or filament.

Our invention relates more particularly to the art of producing sheets, tapes, wires, or filaments of metallic elements of the kind named, which appear in combination with chlorin and ammonium and which can be reduced by heating in the presence of a volatile reducing agent—such as, for instance, ammonium chlorid or other ammonium salts—whereby the volatile matter disappears and the metal is produced in a sheet or film. It has been found, for instance, that iridium and osmium usually occur in combination and that commercially these metallic elements can generally be had in association with a compound of ammonium and chlorin. If to this compound is added an excess of ammonium chlorid and the mixture is heated, the volatile matter disappears and the iridium and osmium are deposited in the form of a metallic film, and if by suitable process the iridium and osmium are first separated the action is as stated above, only of course the metal without alloy is deposited. It is likely that this action takes place on many metallic elements. Our experiments so far have been conducted chiefly with iridium, and we have found that if a thin film of iridium is produced and it is desirable to make it thicker the above-described action can be repeated and the film will be thickened to any desired extent. Acting on the theory above set forth and in carrying out our invention we use the compound salts as stated, and apply them in the form of a paste to a refractory or other substance—such as, for instance, a quartz-tube, rod, or plate, or a metal surface—and heat the said substance, so as to vaporize the volatile salts and leave the metallic deposit. This metallic deposit can be again painted over with the mixture and the latter again reduced and the operation repeated until the film in the form desired is of the necessary thickness. If prefered, a little binding mixture—such, for instance, as dextrin—can be added to the composition to assist in holding it in place.

With these ends in view our invention consists of improvements in the art of producing refractory metallic tapes, bands, wires, and filaments, which will be hereinafter clearly described and claimed.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar numerals of reference indicate corresponding parts in all the views.

Figure 1 is a perspective view showing a refractory plate used for reducing the metal. Fig. 2 shows the composition to be reduced as applied to a rod or cylinder. Fig. 3 is a view of the tape or band as it is produced. Fig. 4 shows how the tape or band can be sawed into wires or filaments. Fig. 5 is a view of one of the wires or filaments which we produce; and Fig. 6 is a view of the wire twisted into a spiral form, so as to give it a generally circular cross-section.

We have shown the above views to indicate a simple way of carrying out our invention, but not with the idea of limiting it to any such apparatus. In Fig. 1 we have shown a band 10 of the composition described—to wit, the combination of iridium, ammonium, and chlorin, together with an excess of a volatile reducing agent, such as ammonium chlorid, or instead of the iridium the metallic element may be some other kind. This coating of the compound salts is applied to either a refractory or metallic surface 11, which is subjected to heat sufficient to volatilize the salts and throw down the metal in the form of a thin foil, tape, or ribbon. If the foil, ribbon, or tape is to be thickened, the composition may be reapplied to the part 10 and reheated, the operation being repeated until the metal is of sufficient thickness. In Fig. 2 we have shown the band 10 produced in spiral form on a rod or cylinder 12,

and for some purposes it can perhaps be better produced on the inner side of a cylindrical tube; but obviously the ribbon or tape can be produced on any refractory or other suitable surface to which a mixture of the composition to be treated can be conveniently applied. If preferred, the cylinders or other surfaces can be completely covered and the deposited metal cut up, as described below. The ribbon or tape 10 or a sheet of the metal can be used as produced for certain purposes; but to further prepare it for use the band 10 or a sheet can be sawed, as shown in 13 in Fig. 4, into a series of longitudinal strips, thus producing wires or filaments 10^a, the gage of which can of course be regulated by making the tape or band more or less thick and by making the saw-cuts more or less near together. The wire 10^a can be twisted into spiral shape, as in Fig. 6, if it is desired to get the effect of a wire which is circular in cross-section, and a filament or wire of this character can be used for many purposes and particularly as a filament for an electric lamp. The spiral form strengthens it structurally and makes a better light when incandescent.

It is obvious that the ribbon or band 10 can be slit up in any convenient and well-known way—as, for instance, by cutting it with a diamond. It will be evident, too, that the proportion of the volatile reducing agent which is used in the reduction processes will necessarily vary with the hardness and thickness of the film to be produced and with the nature of the metallic salts to be treated.

If the metal is deposited as described, it can be peeled off from some surface, as stated, but to other surfaces it adheres, making a firm plating or coating, and metallic surfaces may be coated in this manner for the protection of the metal, or the iridium may be deposited upon a metal which can be dissolved away from the iridium, leaving the iridium in the form of a sheet or plate.

Having thus fully described our invention, we claim as new and desire to secure by Letters Patent—

1. The improvement in the art of producing refractory metallic tapes or wires, which consists in reducing by heat a mixture of iridium ammonium chlorid with an excess of ammonium chlorid, in the form of an elongated metallic tape deposited upon a suitable surface.

2. The improvement in the art of producing refractory metallic wires or tapes, which consists in placing upon a suitable surface salts containing iridium together with ammonium chlorid, the salts being distributed in the form of a tape or band, and then heating the salts, whereby the volatile matter is thrown off and metallic iridium in tape form deposited.

3. The improvement in the art of producing refractory metallic wires or tapes, which consists in placing upon a suitable surface a mixture of iridium ammonium chlorid together with a volatile reducing agent, the material being placed in tape form, and then applying heat to the mixture whereby the volatile matter is thrown off and the iridium tape deposited.

4. The improvement in the art of producing refractory metal tapes or wires, which consists in arranging in the form of a band upon a suitable surface, salts containing iridium chlorin and ammonium, then adding a volatile reducing agent, and then heating the surface so as to produce the metal in band or tape form.

5. The herein-described improvement in the art of producing refractory metallic tapes or wires, which consists in placing upon a suitable surface salts containing iridium ammonium and chlorin, adding thereto a reducing agent, then heating the materials to reduce the metal, and finally slitting up the deposited metal into the form of wires or filaments.

6. The improvement in the art of producing refractory metal tapes or wires, which consists in arranging upon a suitable surface and in band form, salts containing iridium ammonium and chlorin, adding thereto a reducing agent such as ammonium chlorid, then heating the materials to reduce the metal in the form of a tape, and finally slitting the tape into wires or filaments.

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