(No Model.)

F. CHAPLET.

HARD BODY FOR RIFLING CHROMATED STEEL.

No. 589,161. Patented Aug. 31, 1897.

Fig. 1.

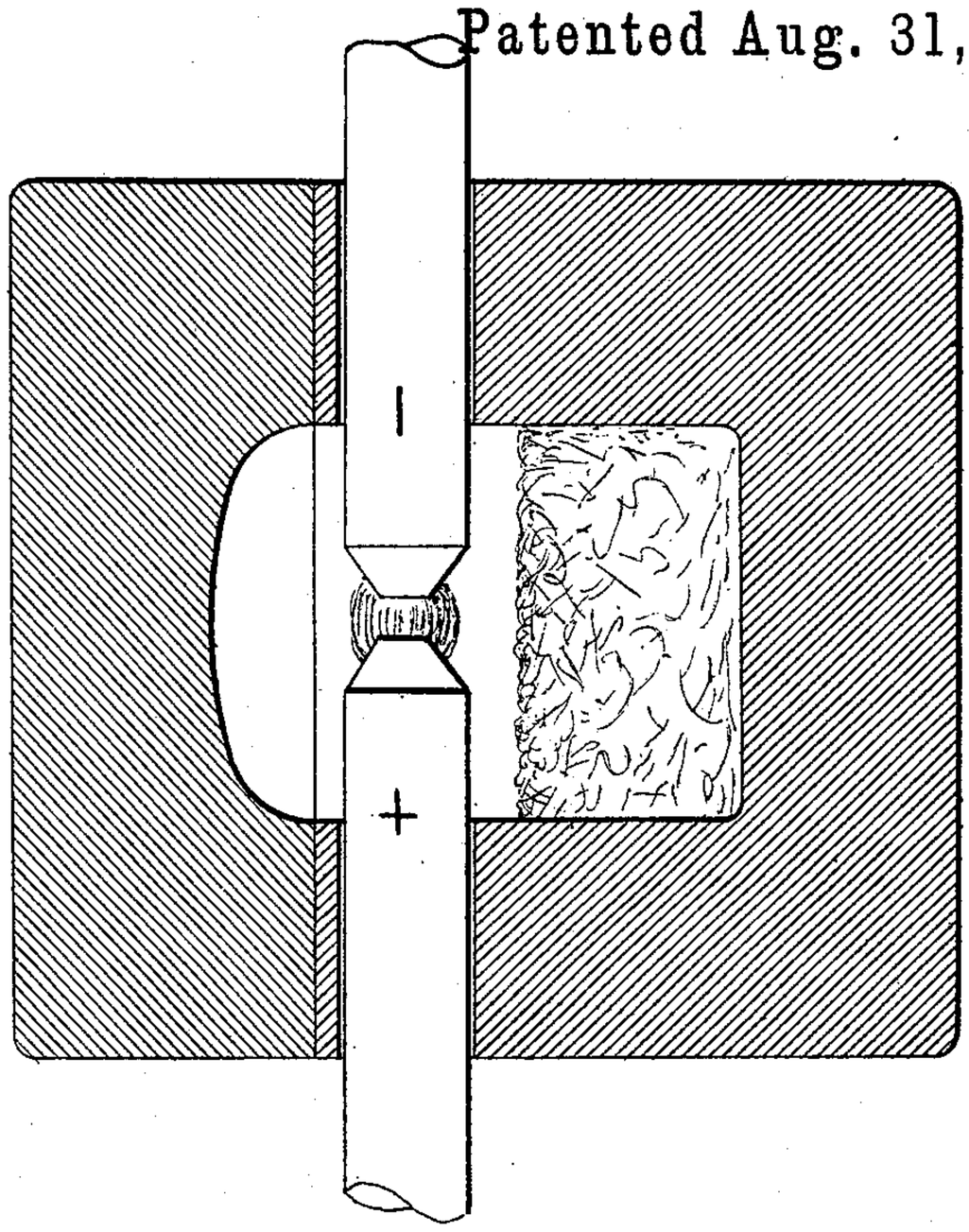
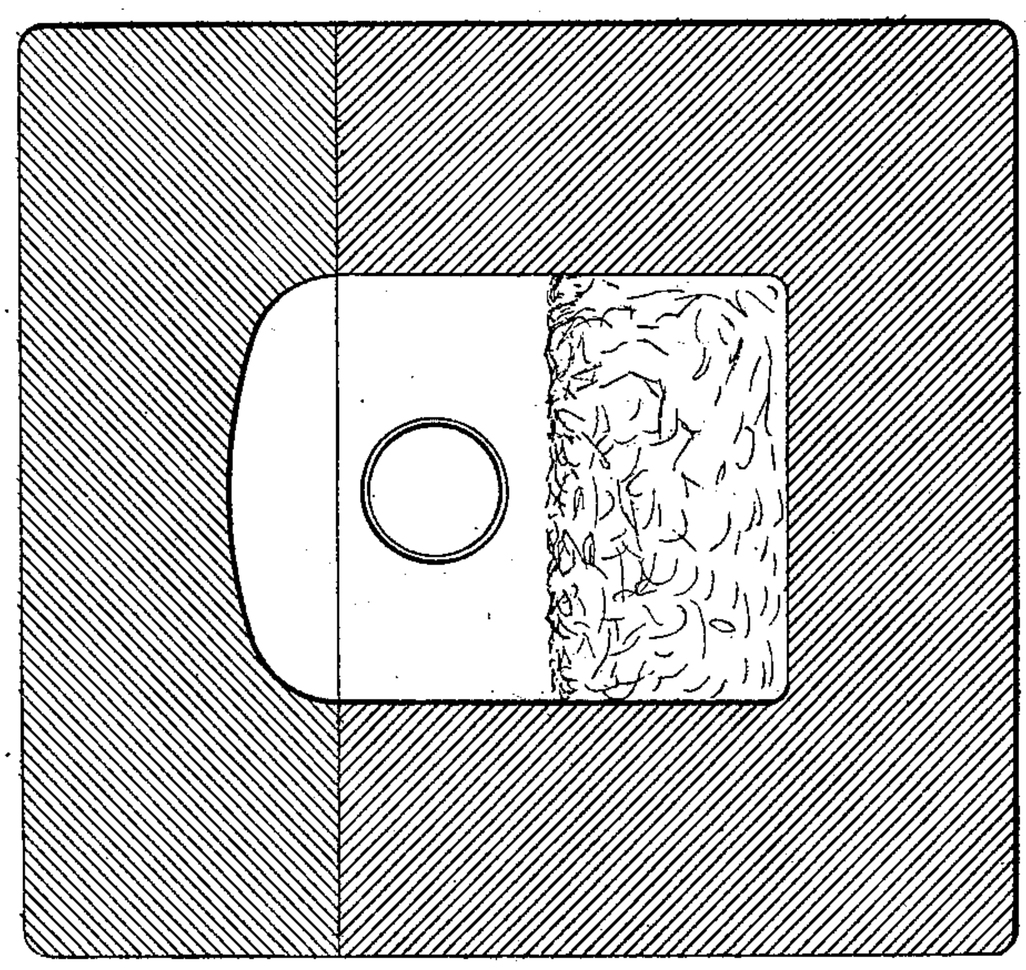


Fig. 2.



Attest

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UNITED STATES PATENT OFFICE.

FRÉDÉRIC CHAPLET, OF LAVAL, FRANCE.

HARD BODY FOR RIFLING CHROMATED STEEL.

SPECIFICATION forming part of Letters Patent No. 589,161, dated August 31, 1897.

Application filed September 15, 1894. Serial No. 523,137. (Specimens.) Patented in France August 8, 1893, Nos. 232,034 and 232,037.

To all whom it may concern:

Be it known that I, FRÉDÉRIC CHAPLET, a citizen of the Republic of France, residing at Laval, France, have invented certain new and useful Improvements in Hard Bodies for Rifling Chromated Steel, Cutting Rubies and Diamonds, and Methods of Making the Same, (for which I have received patents in France, Nos. 232,034 and 232,037, dated August 3, 1893,) of which the following is a specification.

The object of my invention is relative to the preparation of some new very hard compounds, designated under the name of "hard bodies," capable of scratching chrome-steel and suitable for cutting and shaping hard stones, such as rubies and sapphires, and even for cutting and shaping diamonds.

The constituents of these new hard bodies are taken among the sample bodies (metalloids and metals) enumerated as follows: first, metalloids—carbon and silicium; second, metals, (difficult to melt,)—titanium, chromium, molybdenum, and tungsten.

It is through the combination of two, or, more generally, of three, of the above-mentioned constituents that are obtained the following new hard bodies—such as, for instance, first, titanid of silicium by the combination of titanium and silicium; second, carbo titanid of silicium by the combination of titanium, carbon, and silicium; third, silicid of chromium by the combination of silicium and chromium; fourth, carbo silicid of molybdenum by the combination of carbon, silicium, and molybdenum; fifth, carbo silicid of tungsten by the combination of carbon, silicium, and tungsten.

The combinations which give rise to these different compounds or very hard bodies can only be obtained by way of igneous melting, which requires the high heating attained by means of suitable electric furnaces.

The constituents of the compounds, called "hard bodies," in question, above enumerated, are taken for use in the following state: first, metalloids—carbon in the shape or state of pulverized coke, silicium in the shape or state of silicic acid, (SiO_2,) pulverized; second, metals—titanium in the shape or state of titanic acid (Rutile), (TiO_2,) pulverized; chromium in the shape or state of sesquioxid of chromium, (CrO_3,) pulverized; molybdenum in the shape or state of molybdic acid, ($M.O_3$,) pulverized; tungsten in the shape or state of tungstic acid, ($W.O_3$,) pulverized.

For the preparation of the hard bodies enumerated above it is necessary to proceed, first, to the intimate mixing of their constituents in the above-described state with the necessary proportion of pulverized carbon required for the process of reduction in case carbon is not one of their constituting elements. For instance, for making silicid of chromium silicic acid and sesquioxid of chromium pulverized are intimately mixed with the proportion of pulverized carbon required for their reduction. When, on the contrary, carbon is one of the constitutive elements—as, for instance, in carbo titanid of silicium—to the intimate mixture of titanic acid and of silicic acid pulverized must be added the total proportion of carbon required in order that after the reduction of titanic acid and silicic acid there remains in excess the proportion of carbon necessary for the proper composition of the product. Each of these mixtures thus prepared is introduced in an electric furnace, where it is submitted, during the necessary time, to the high temperature which is indispensable in order to operate the reduction and the combination by way of igneous melting of its elements.

When that operation is completed, the heating is stopped and the melted mass is allowed to cool. After complete cooling that mass presents itself under a more or less metallic form, more or less compact, more or less crystallized, of a very great hardness, which is the characteristic of the compound thus prepared. For instance, in order to obtain the new very hard compound, the constituents of which are carbon, titanium, and silicium, combined in the proportion of their chemical equivalents, represented by the formula: 6c—24Ti—14Si.—that is, carbon (C) equals 13.63 per cent., titanium (Ti) equals 54.55 per cent., silicium (Si) equals 31.82 per cent.—total, 100.

The mixture to be treated in the electric furnace, as it is said above, will be composed

of carbon, titanic acid, and silicic acid in the following proportions: for one hundred parts, carbon (C) thirty parts, titanic acid (TiO_2) forty parts, silicic acid (SiO_2) thirty parts—total, 100, giving thus for this mixture the formula: $30C-40TiO_2-30SiO_2$.

What I claim is—

The new product, a very hard compound, consisting of carbon, titanium and silicium, in chemical combination, substantially as described.

In witness whereof I have hereunto set my hand in presence of two witnesses.

FRÉDÉRIC CHAPLET.

Witnesses:
CHARLES MERVILLE,
CLYDE SHROPSHIRE.