UNITED STATES PATENT OFFICE.

PHILIP M. McKENNA, OF WASHINGTON, DISTRICT OF COLUMBIA.

PROCESS OF TREATING FERROTUNGSTEN.

1,208,596. Specification of Letters Patent. Patented Dec. 12, 1916.

No Drawing. Application filed August 11, 1916. Serial No. 114,479.

To all whom it may concern:

Be it known that I, PHILIP M. McKENNA, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Processes of Treating Ferrotungsten; and I do hereby declare the following to be a full, clear, and exact description of the same.

Commercial ferro tungsten is usually a product produced by treatment of the ore in an electric furnace and generally contains substances, particularly sulfur, phosphorus and carbon, in objectionable quantities, especially when the product is to be used in the manufacture of what is known as high speed steel.

The present invention has for its object the elimination, or the material reduction in percentage, of such deleterious substances, and especially the elimination of the sulfur content.

In accordance with the present invention the lump ferro tungsten alloy is reduced to a comminuted condition, preferably by grinding. This comminuted ferro tungsten is then subjected to the action of an acid which acts upon the material to combine with some or all of the impurities, with the result that the sulfur may be practically eliminated and the percentage of phosphorus and carbon materially reduced, while the metallic condition of the ferro-tungsten alloy (iron tungstide) is not changed. After treatment with the acid the comminuted substance is washed with water to eliminate the acid and any materials dissolved therein, and subsequently dried for use. The acid which is preferably used is muriatic acid of commercial gravity; that is to say, approximately of 20° Baumé, and the proportion of acid used is preferably about thirty-seven and one half per cent. by weight of the ferro tungsten treated, but acids having similar properties may be employed, as will be obvious to chemists familiar with metallurgical chemistry. For example, another acid which might be employed, although, at this time somewhat more expensive, is hydrofluoric acid; or sulfuric acid might be used, the use of the latter, however, requiring that the sulfates shall be completely washed out, and as a commercial proposition this may be somewhat more difficult and expensive than the washing necessary where muriatic acid is employed.

In the practical utilization of the invention, it is found that, while the sulfur is removed and the percentage of phophorus and carbon materially reduced, there is also some removal of manganese and iron; although the greater portion of the iron remains combined with the tungsten and is not acted upon. Thus, the percentage of tungsten is increased, and while the chemical reactions are not deemed to be important for a complete understanding of the invention; nor is it believed that the action is fully understood at this time, still it may be stated that it is applicant's belief that the sulfur is completely volatilized as hydrogen sulfid, and that the phosphorus and carbon, or a large proportion of the phosphorus and carbon are removed by the formation of hydrogen carbids and phosphids. Regardless of the chemical re-action in connection with any one of these substances, the process set forth results in the elimination of the sulfur and a material reduction in the phosphorus and carbon contents, without changing the metallic condition of the iron tungstid alloy,—a result which is of great commercial value in the production of ferro tungsten.

After the re-action has taken place the solution is completely washed out of the remaining ferro-tungsten with water, and the comminuted ferro-tungsten itself is dried, when it is ready for subsequent use, either in the manufacture of high speed steel or otherwise.

What is claimed is:—

1. The process of treating smelted ferrotungsten alloy for the removal of metalloid impurities, which consists in comminuting the smelted mass, then subjecting the comminuted material to the action of an acid which will combine with the impurities in the production of hydrogen compounds and which will not combine with the metallic alloy.

2. The process of treating smelted ferrotungsten alloy for the removal of metalloid impurities, which consists in comminuting the smelted mass, then subjecting the comminuted material to the action of an acid which will combine with the impurities in the production of hydrogen compounds and which will not combine with the metallic alloy, then washing out the acid solvent and finally drying the comminuted ferro-tungsten.

3. The process of removing sulfur from

smelted ferro-tungsten, which consists in comminuting the smelted mass, then volatilizing the sulfur in the form of hydrogen sulfid by treatment with an acid which will not combine with the metallic tungsten alloy, and finally washing and drying the comminuted product.

4. The process of removing sulfur, phosphorus and carbon from smelted ferro-tungsten, which consists in grinding the smelted mass, then treating it with muriatic acid of approximately 20° Baumé, and finally washing and drying the comminuted product.

PHILIP M. McKENNA.