

UNITED STATES PATENT OFFICE.

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HIGH-SPEED STEEL.

1,210,625.

Specification of Letters Patent.

Patented Jan. 2, 1917.

No Drawing.

Application filed February 19, 1916. Serial No. 79,430.

To all whom it may concern:

Be it known that I, JOSEPH M. FLANNERY, a citizen of the United States, and a resident of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in High-Speed Steel; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in steel alloys, and more particularly to that alloy which is known in the art as "high-speed" steel,—one object of the invention being to produce an improved high speed steel possessing greater hardness and toughness and rendered capable of greater thermal absorption as will enhance the efficiency of the metal when used as cutting steel in the art of metal cutting, than has heretofore been accomplished.

A further object is to produce a high speed steel, in which a hardening and toughening material shall be used, which shall also act effectually as a deoxidizing and denitrogenizing agent.

A further object is to decrease the cost of manufacturing high speed steel, and at the same time enhancing the efficiency of the same.

With these and other objects in view, the invention consists in a high speed steel such as hereinafter described and defined in the claims.

The invention further consists in steel having uranium incorporated therein and constituting the sole added hardening, toughening and thermal absorption agent necessary to form high speed steel.

The uranium may be incorporated into the steel in the form of ferro-uranium, or uranium metal may be employed. I prefer to add the uranium from five to ten minutes before pouring, and after de-slagging. The steel should be poured as soon as the uranium alloy or uranium metal has melted which may require from five to ten minutes. Less time will be required for the

melting and alloying of the uranium with the steel, if an electric furnace be employed, rather than a crucible.

I prefer to employ ferro-uranium or uranium metal in such quantity, that the finished steel shall contain a proportion of uranium as great as five per cent. or from .05% to 5%.

I have found that high speed steel containing uranium in the proportion substantially as stated, possesses qualities of great hardness and toughness; that the uranium imparts to the steel that quality of thermal absorption which, in conjunction with hardness and toughness, renders the steel very efficient for use as tool steel in the art of metal cutting.

I have found that the uranium acts as a deoxidizing and denitrogenizing agent, thereby increasing the strength and ductility as well as heat resisting qualities; that it adds materially to the cutting qualities of the steel, and that brittleness is reduced to a minimum.

The alloy may be crushed to the desired size and applied to the molten mass while pouring in the ladle, or after the molten mass is in the ladle. It may also be applied in the crucible or furnace.

High speed steels as is well known comprise steels of various compositions, to which some element has been added to produce the qualities necessary to produce high speed steel. Heretofore, tungsten has been the usual added element. The character of the steel to which said other element has been added has varied considerably.

This invention contemplates the employment of uranium to impart to steel, high speed qualities.

Having fully described my invention what I claim as new and desire to secure by Letters-Patent, is:—

1. High speed steel containing uranium as the sole added toughening agent.
2. Steel having uranium incorporated therein and constituting the sole added element necessary to form high speed steel.
3. High speed steel comprising steel hav-

ing uranium alloyed therewith in the proportion approximately as specified.

4. High speed steel having alloyed therewith as the sole added toughening agent, a proportion of uranium as ranging from .05 per cent. to 5 per cent.

In testimony whereof, I have signed this

specification in the presence of two subscribing witnesses.

JOSEPH M. FLANNERY.

Witnesses:

WILLIAM GANLEY,
H. B. KEARNEY.