No. 654,984. Patented July 31, 1900.

E. M. JOHNSON.

PROCESS OF PRODUCING STEEL.

(Application filed Apr. 17, 1900.)

(No Model.)

Fig. 1.

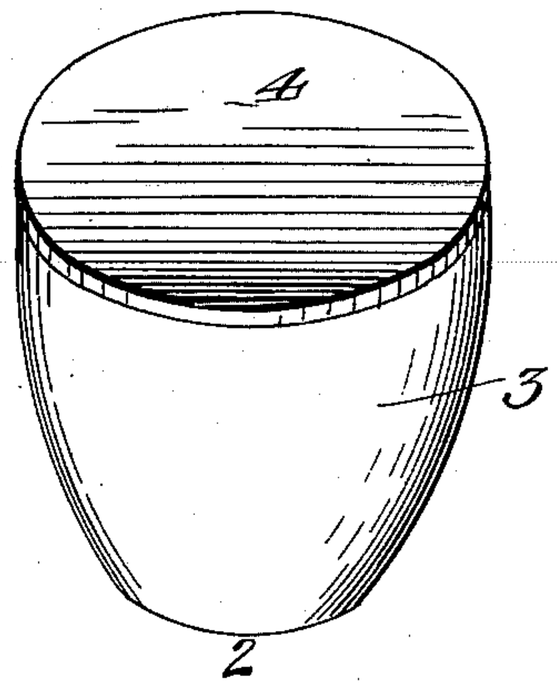


Fig. 2

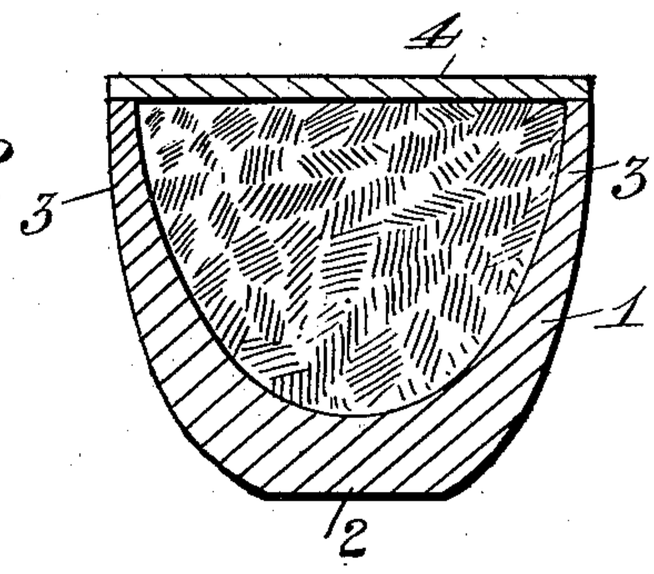
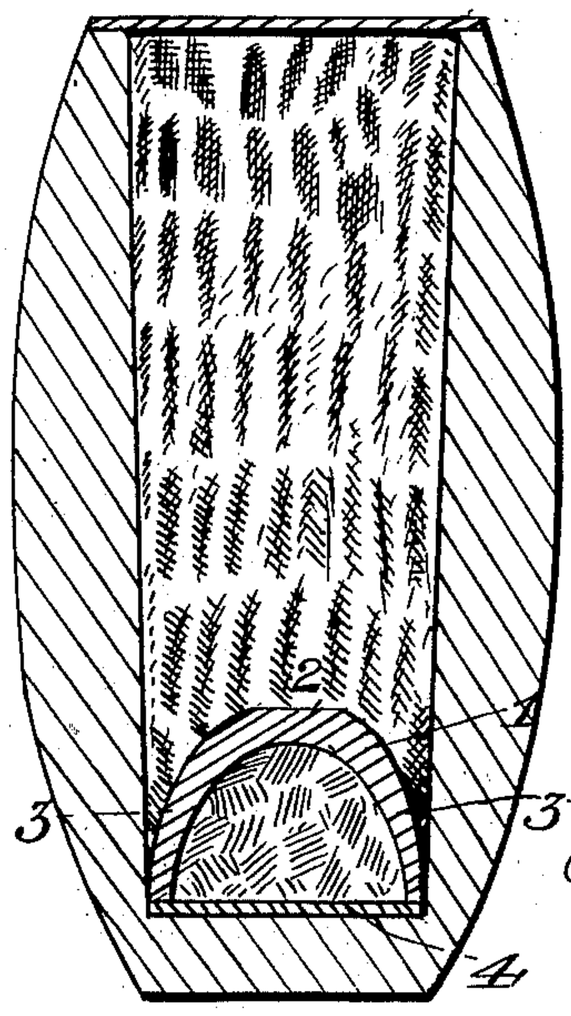


Fig. 3.



Witnesses
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UNITED STATES PATENT OFFICE.

ELIAS M. JOHNSON, OF NEW YORK, N. Y.

PROCESS OF PRODUCING STEEL.

SPECIFICATION forming part of Letters Patent No. 654,984, dated July 31, 1900.

Application filed April 17, 1900. Serial No. 13,215. (No specimens.)

To all whom it may concern:

Be it known that I, ELIAS M. JOHNSON, a citizen of the United States, residing at New York, in the county of New York and State of New York, having invented new and useful Improvements in Processes of Producing Steel, of which the following is a specification.

My present invention relates to the production of steel, and more particularly to a crucible process of incorporating and absorbing such metals as chromium, tungsten, or titanium with the other materials in the making of the higher grades of steel. In the methods heretofore employed in the manufacture of steel of the grade referred to it has been difficult to obtain uniform results in different meltings, owing to the fact that if the materials to be incorporated are heavier than the steel they will remain at the bottom of the crucible and become coated with a thin covering of slag when the steel first begins to melt, thus interfering with the complete and uniform absorption of these heavier metals, even by long heating. If the metals sought to be incorporated are lighter than steel, they rise to the top of the molten mass and become oxidized and mixed with the slag, thus failing to be completely absorbed, and they are partially lost. For these reasons the results in the manufacture of steels of the characters referred to have been variable and dependent upon surrounding conditions which failed to attain uniformity in the product.

During a long series of experiments I have discovered that if the metals which are to be incorporated during the process of making the steel should be kept out of contact with the molten mass until such time as they will become pliant by heat they will readily liquefy and coalesce.

In my process I make use of a steel cup for containing the chromium, tungsten, or titanium. These cups may be of different sizes, depending upon the amount of material to be incorporated with the molten mass, and I preferably make the cup of greater thickness at the bottom than at the sides and top. I also use a cover for the steel cup in order that the materials inside may not come in contact with the mass. When the cup becomes thoroughly heated and softened, it absorbs the metals contained therein and forms an alloy, which is then readily taken up and absorbed by the mass of molten steel. The advantages of such a procedure are that just the required amount of the metals to be incorporated may be used and a uniform result obtained.

In the accompanying drawings, which form part of this specification, I have illustrated the auxiliary means which I employ in carrying out my improved process.

Figure 1 is a perspective view of the steel cup which I use. Fig. 2 is a central vertical section thereof. Fig. 3 is a central vertical sectional view of a crucible containing the cup in an inverted position.

Like numerals designate like parts wherever they occur in the different views.

The numeral 1 designates a steel cup. 2 is the bottom thereof, and 3 indicates the side walls. It will be noticed that the bottom of the cup is much thicker than the side walls at the top. A plate or cover 4 is designed to be placed on top of the cup when used.

In carrying out my process I place in a cup similar to the one illustrated a quantity of either chromium, tungsten, or titanium and place the cover or plate 4 on the mouth of said cup. It will be understood, of course, that I may use one of said metals, or I may place a quantily of two or all of the metals in the cup together, depending upon the character of the result which I desire to obtain. If the percentage of the metals to be used should be heavier than steel, I place the cup containing said metals in the crucible with its mouth or opening upward and covered by the plate 4. If the percentage should be such as to make it lighter than the steel, I invert the cup upon the cover after the metals have been placed therein and then place it in the crucible.

The specific gravity of each of the metals used is given below: chromium, 7.01; tungsten, 18.30; titanium, 3.9 to 4.25; steel, 7.75 to 7.55. Hence if the percentage should contain a quantity of chromium and titanium it would be lighter than steel, and if tungsten be used either alone or in combination with the other metals it would be heavier than the steel.

The object of inverting the cup is that a greater resistance is offered to the rise of the

materials in the cup and because this condition retards the mixture of the cup and its contents with the molten mass until the cup has thoroughly absorbed its contents and formed an alloy therewith which will readily coalesce.

Having thus fully described my invention, what I claim is—

1. The process of incorporating metals with steel during its conversion which consists in placing in a closed metal receptacle metals which will form an alloy with said receptacle, placing the receptacle in a crucible and piling the charge of steel around it, heating the charge until the contents of the receptacle form an alloy with said receptacle, and continuing the application of heat until the alloy thus formed is taken up and mixed with the entire charge.

2. The process of incorporating such metals with steel during its conversion as will form an alloy therewith, which consists in placing such metals in a closed steel receptacle or cup, inserting said cup in a crucible, placing iron or steel scrap around the cup, and heating the whole mass until the cup absorbs its contents and alloys therewith, and continuing the application of heat until the alloy thus formed is absorbed by the mass, substantially as described.

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

ELIAS M. JOHNSON.

Witnesses:
ANDREW E. MARTIN,
J. EDWARD KAVANAUGH.