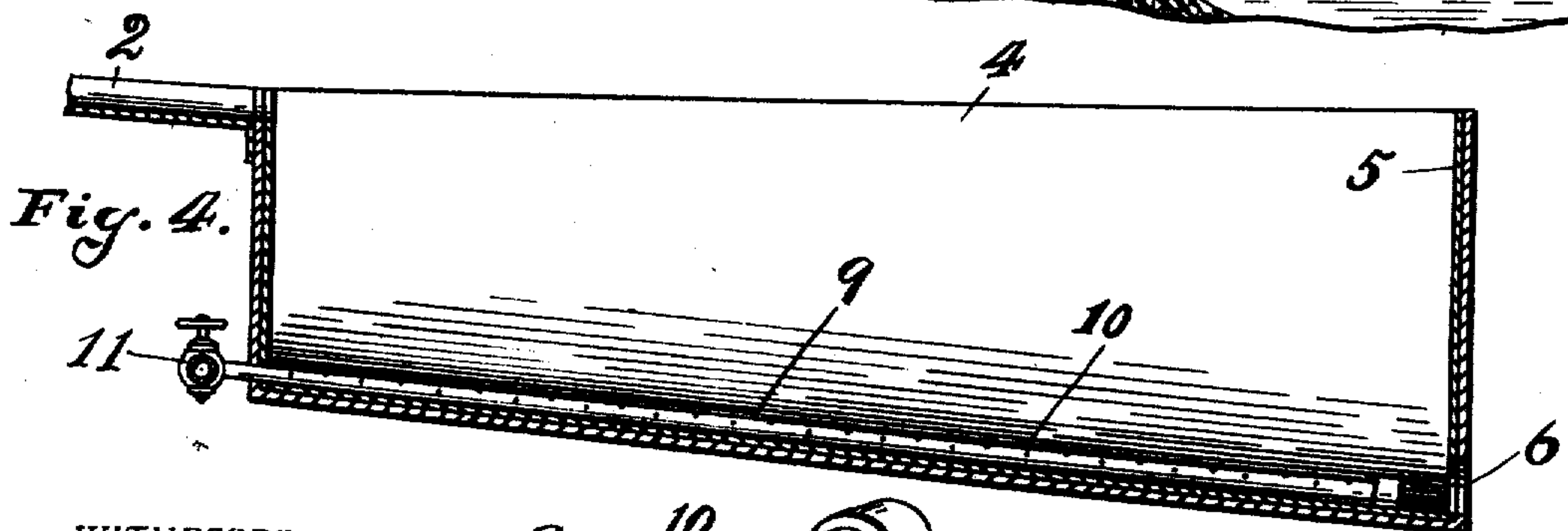
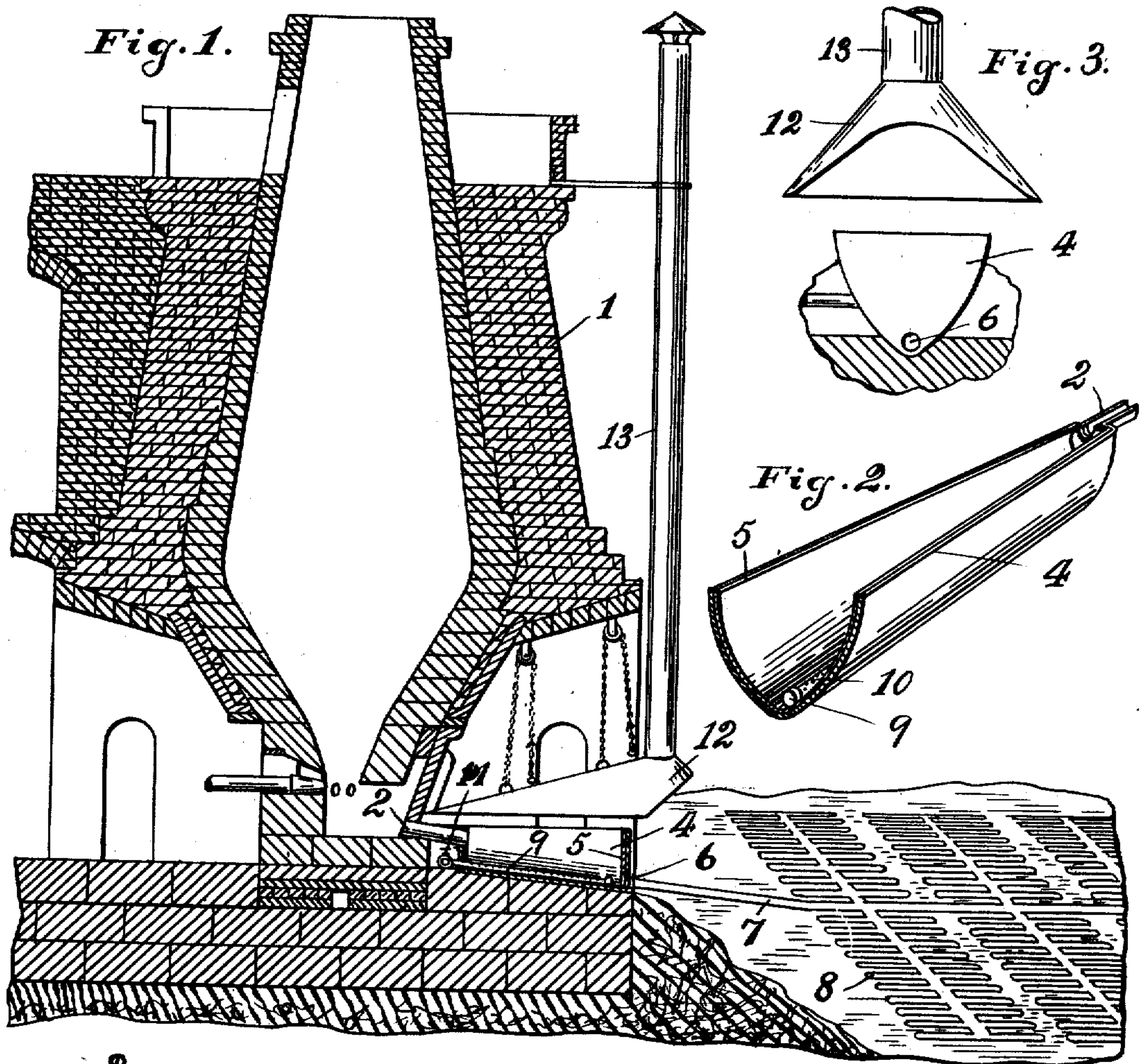


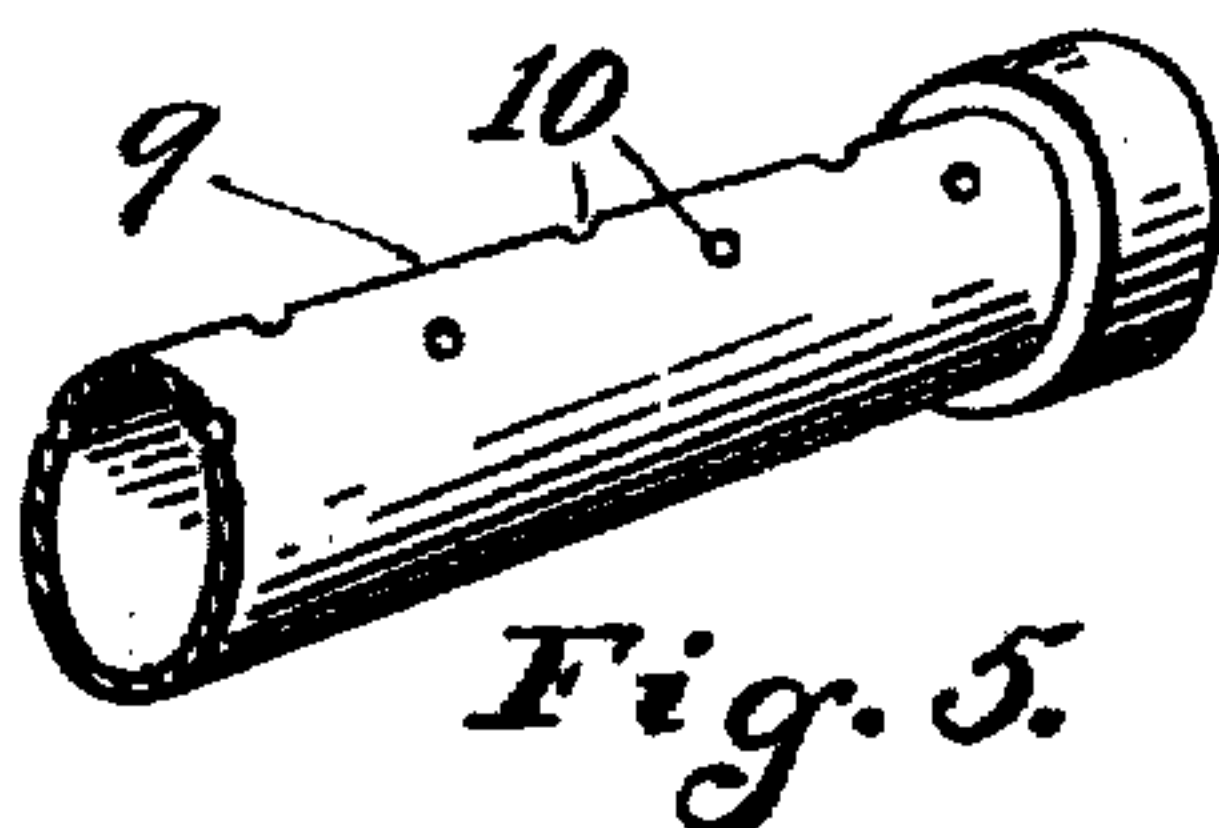
No. 843,569.

PATENTED FEB. 5, 1907.

H. LUCKENBACH.  
TREATMENT OF IRON AND STEEL.  
APPLICATION FILED FEB. 10, 1906.



WITNESSES:  
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# UNITED STATES PATENT OFFICE.

HARRY LUCKENBACH, OF SAN FRANCISCO, CALIFORNIA, ASSIGNOR OF PART INTEREST TO WILLIAM H. KELLY, OF SAN FRANCISCO, CALIFORNIA, GEORGE L. ROBINSON, FREDERICK E. FISHEL, AND JOSEPH J. ROBINSON, OF NEW YORK, N. Y., AND FREDERICK F. NOLTE.

## TREATMENT OF IRON AND STEEL.

No. 843,569.

Specification of Letters Patent.

Patented Feb. 5, 1907.

Application filed February 10, 1906. Serial No. 300,385.

*To all whom it may concern:*

Be it known that I, HARRY LUCKENBACH, a citizen of the United States, residing at San Francisco, in the county of San Francisco and State of California, have invented certain new and useful Improvements in Treatment of Iron and Steel, of which the following is a specification.

This invention relates to new and useful improvements in the treatment of iron and steel, (and other minerals,) the object of the invention being to provide an improved process of treating molten cast-iron upon leaving the blast-furnace preparatory to being run into pigs or shapes for shipment, whereby the quality of the pig-iron will be greatly improved and subsequent processes of refining the pig-iron will be rendered more or less unnecessary.

The molten iron produced by a blast-furnace contains a percentage of phosphorus and silicon, which, though small in proportion, affect very deleteriously the quality of the iron, this being particularly true of the phosphorus, so that various processes of puddling, refining, or the like are resorted to to remove these impurities for the production of steel from iron. I have discovered a method by which this removal can be accomplished while the iron is still in its fluid condition coming from the blast-furnace, thereby avoiding expensive methods of refining which involve the reheating of the iron.

In the accompanying drawings, Figure 1 is a vertical section illustrating an apparatus applied to a blast-furnace in which my improved process can be carried out. Fig. 2 is a perspective view, one end being broken away, of the refining-tank used in said process. Fig. 3 is an end view of the tank, showing also the hood for carrying off the gases. Fig. 4 is a longitudinal vertical section of the tank, the steam-pipe being shown in side elevation. Fig. 5 is a broken perspective view of said steam-pipe.

Referring to the drawings, 1 represents a blast-furnace, the parts of which being of common construction need not be further specified, from which blast-furnace the molten iron runs by a conduit 2 into a refining-tank 4, coated upon the inner side with a suitable loam or wash 5 to prevent the molten iron adhering to said tank. Said tank is

rounded or tapering at the bottom and widens at the outer end, as shown. At the bottom of its outer end is an outlet 6, leading to the sow 7 and pigs 8 in the usual manner. In the bottom of said tank is laid a narrow tube 9 of platinum, closed at the outer end and perforated, as shown at 10, the entrance to said tube being controlled by a valve 11. Above the tank is a hood 12, having a stack 13.

The process is as follows: First, superheated steam of as high a temperature as can be conveniently obtained is passed into the platinum tube and through the perforations until the parts are so highly heated that the issuing steam is free from moisture. Then the molten iron is tapped from the blast-furnace into the tank. As the molten iron covers the platinum tube the highly-superheated steam is discharged into the iron in all directions and passes upward and outward therethrough, being immediately raised to the temperature of the iron and dissociated. The oxygen and hydrogen of the steam unite with the residual impurities in the iron and particularly with the phosphorus, and the resulting gases are collected by the hood and pass off up the stack. After the superheated steam has been allowed to flow for a sufficient length of time to completely effect the separation from the iron of the phosphorus and the other impurities it is shut off, the outlet 6 is opened, and the iron is permitted to flow out in the usual manner.

I claim—

The process of purifying iron which consists in generating steam, superheating the steam, passing the superheated steam into the bottom of a vessel adapted to contain molten iron until the issuing steam is entirely free from moisture, then tapping the molten iron into said vessel from the blast-furnace, and continuing the injection of the superheated steam into the molten iron while at rest in said vessel, substantially as described.

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

HARRY LUCKENBACH.

Witnesses:

BESSIE GORFINKEL,  
FRANCIS M. WRIGHT.