

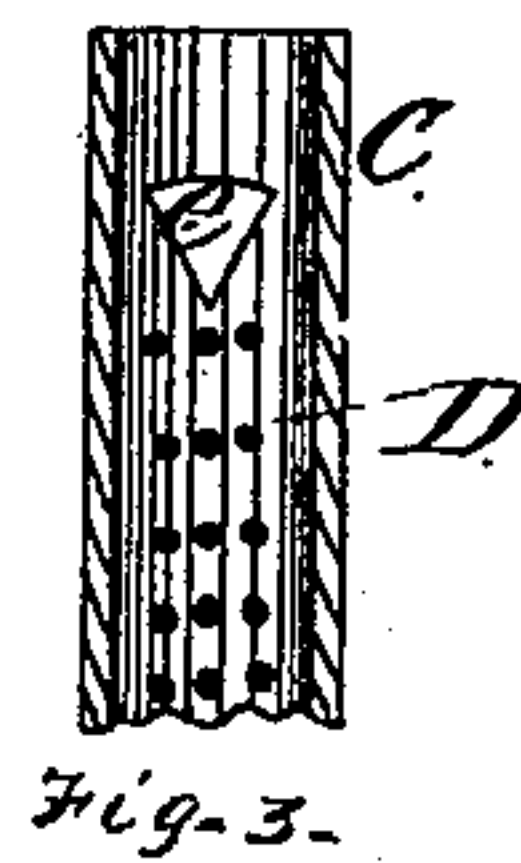
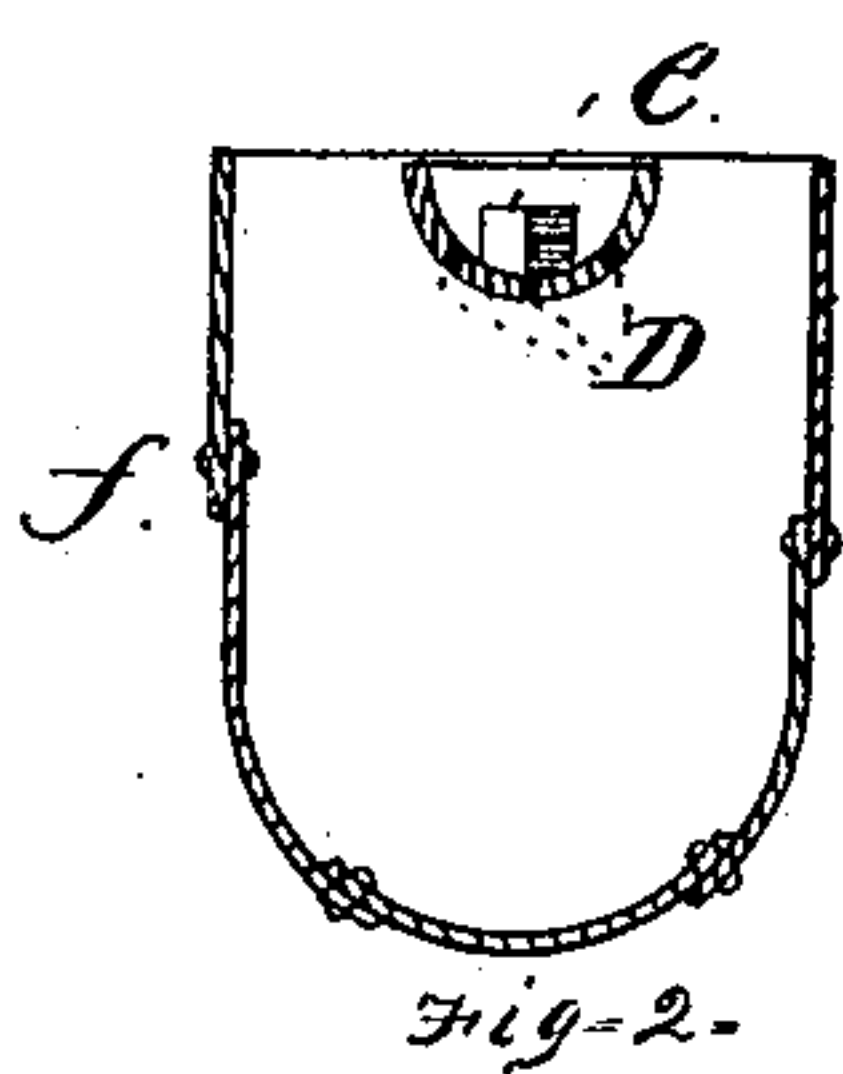
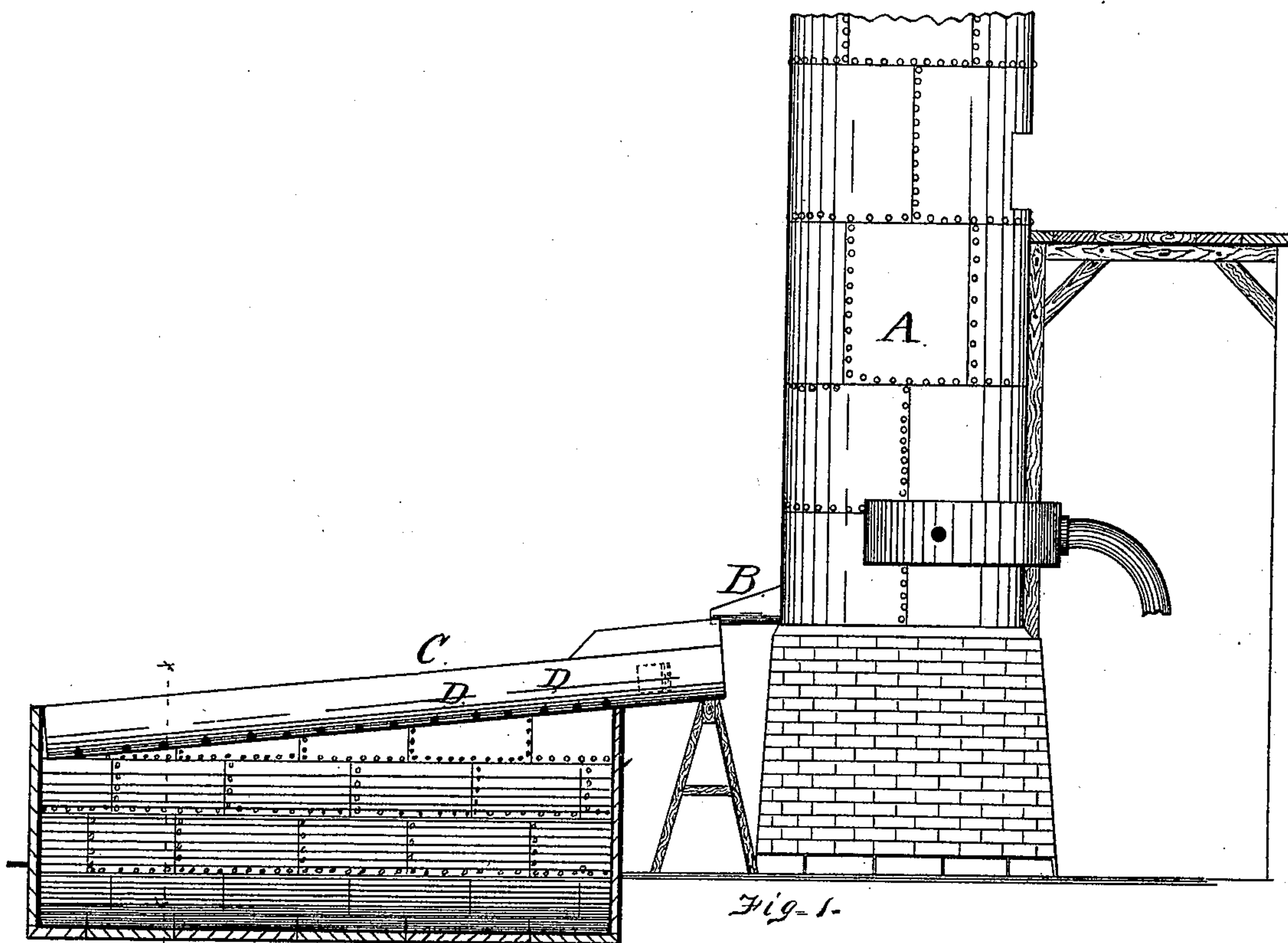
2 Sheets—Sheet 1.

J. J. JOHNSTON.

MANUFACTURE OF IRON AND STEEL.

No. 174,682.

Patented March 14, 1876.



WITNESSES.

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J. L. Hewitt

INVENTOR.

James J. Johnston

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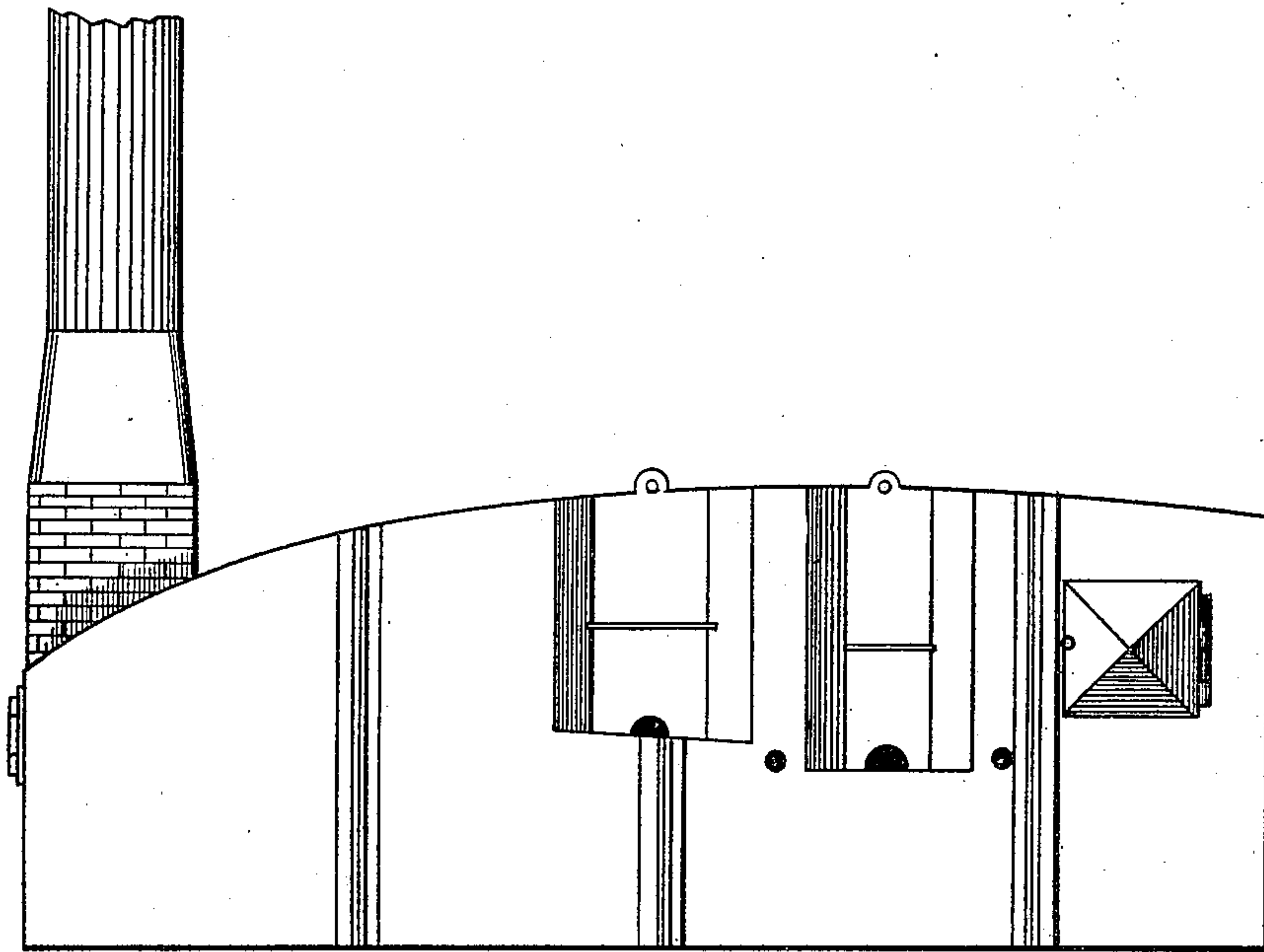


FIG. 4.

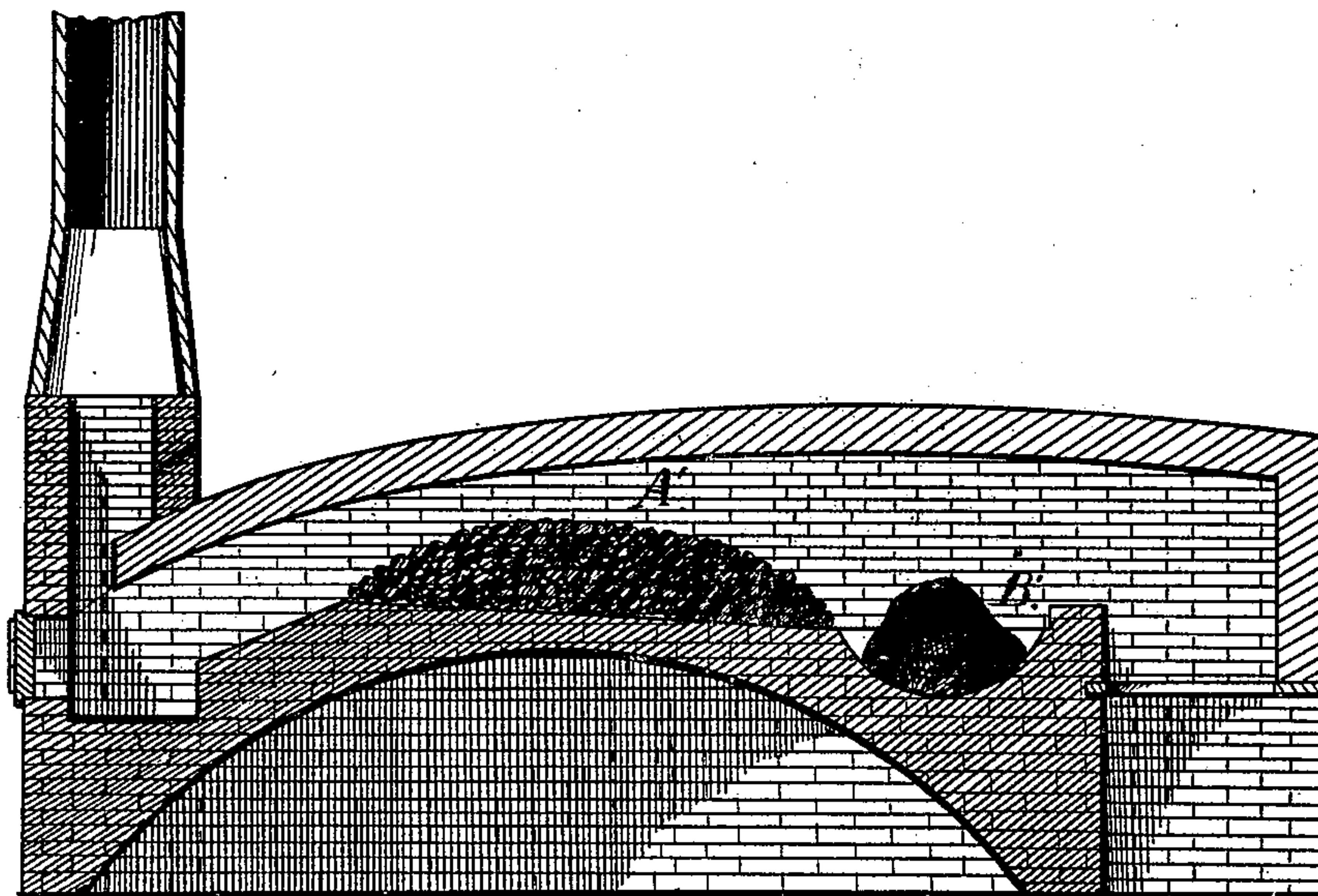


FIG. 5.

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JAMES J. JOHNSTON, OF COLUMBIANA, OHIO.

IMPROVEMENT IN THE MANUFACTURE OF IRON AND STEEL.

Specification forming part of Letters Patent No. **174,682**, dated March 14, 1876; application filed August 17, 1875.

To all whom it may concern:

Be it known that I, JAMES J. JOHNSTON, of Columbiana, in the county of Columbiana and State of Ohio, have invented a new and useful Improvement in the Manufacture of Iron and Steel; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and the letters of reference marked thereon.

My invention relates to the manufacture of iron and steel, and is an improvement upon the inventions described in Letters Patent granted to me and bearing dates and numbers as follows: July 27, 1869, No. 93,155; November 16, 1869, No. 97,017; January 9, 1872, No. 122,524; May 14, 1872, No. 126,708; May 14, 1872, No. 126,709; May 14, 1872, No. 126,710.

My present invention consists in purifying molten cast-iron by allowing it to flow in a series of fine streams into a liquid solution, consisting of water in which is dissolved the nitrate of soda, to which is added pulverized oxide of iron or other metallic oxide as detergent and oxidizing agents, and subsequently subjecting the iron thus purified and refined to heat, after which it is formed into balls and then subjected to the squeezing, rolling, or hammering process.

To enable others skilled in the art to make and use my invention, I will proceed to describe more fully the operation.

In the accompanying drawings, which form part of my specification, Figure 1 represents a side elevation of a cupola or smelting-furnace, and a section of a reservoir for the purifying, refining, oxidizing, and detergent solution, said reservoir being provided with a trough furnished with a series of apertures, said trough and reservoir being arranged in juxtaposition with relation to the spout of a cupola or smelting-furnace. Fig. 2 is a transverse section of the trough and reservoir. Fig. 3 is a top view or plan representing a section of the trough. Fig. 4 is a side elevation of the heating-furnace. Fig. 5 is a vertical and longitudinal section of the same.

A represents a cupola or smelting-furnace, and B its spout. C represents the trough leading from the spout over the reservoir *f*, and is provided with a large number of small

apertures, D. In the end of the trough C, next to the spout of the cupola or smelting-furnace, is arranged an abutment, *e*. The interior of the trough C is lined with loam-clay, which is coated with pulverized iron-ore. Having the trough thus coated and thoroughly dried, it is arranged over the reservoir, and the reservoir arranged with relation to the cupola or furnace as represented in Fig. 1. I then dissolve, in sufficient water to fill the reservoir, nitrate of soda, adding about one pound of soda to every five gallons of water, and then adding to this solution finely-pulverized oxide of iron, (iron-ore,) adding about two pounds of it to every five gallons of the aforesaid solution. I then tap the cupola or furnace and allow the molten metal to flow into the trough C. The molten metal, striking against the abutment *e*, will spread over the bottom of the trough, and will pass through the apertures D in a series of fine streams, and, falling into the solution, will be purified, refined, and granulated, care being taken to thoroughly stir and agitate the solution during the time the molten metal is flowing into it. The purified, refined, and granulated metal is then removed from the reservoir and placed on the hearth A' of the furnace, represented in Fig. 5, where it is subjected to heat, bringing it to a friable condition, after which it is gradually worked down into chamber B' of the said furnace, where it is formed into balls, which are withdrawn from the furnace and subjected to the squeezing, rolling, or hammering process, for the purpose of forming blooms or "muck-bar," which are afterward treated and manipulated in the usual manner and by the ordinary means, for the purpose of forming merchantable iron.

It being a fixed law of matter that the several sorts of matter possesses each its own combining quantity and affinity, I have, in accordance with this law, divided the nitrate of soda into ultimate particles by dissolving it in water, and have divided the oxide of iron in like particles by pulverization, and destroy the cohesion of these different kinds of matter by said dissolving-pulverization, and holding them in this divided condition in water, so that the molten iron in flowing into it will combine with the nitrate of soda and oxide of

iron in such manner and quantity as will result in securing the desired deterrent and oxidizing action of the deterrent and converting agents, whereby the molten iron will be purified and so changed in its character that by subjecting it to heat while imbedded in charcoal will produce a good quality of steel, or by subjecting the granulated iron to heat in a furnace, as hereinbefore described, it can be formed into balls for the squeezer, hammer, and muck-rolls without resorting to the boiling or puddling process common in the manufacture of iron.

I wish it clearly understood that I do not claim, broadly, granulating molten cast-iron in the process of manufacturing wrought-iron or steel, for such operation is old, and has been performed in various ways; but

What I claim is—

1. The process of manufacturing iron and steel, consisting in running the molten cast-iron into a bath of water holding nitrate of soda in solution, and a metallic oxide in suspension, as deterrent and converting agents, substantially as described.

2. The process of manufacturing steel, consisting in running the molten cast-iron into a bath of water with nitrate of soda and a metallic oxide to granulate the iron, and then subjecting the iron so treated to heat while imbedded in charcoal, substantially as described.

JAMES J. JOHNSTON.

Witnesses:

A. C. JOHNSTON,
J. F. HEWITT.