

Z. S. DURFEE.

Improvement in the Manufacture of Iron and Steel.

No. 114,277.

Patented May 2, 1871.

Fig. 1.

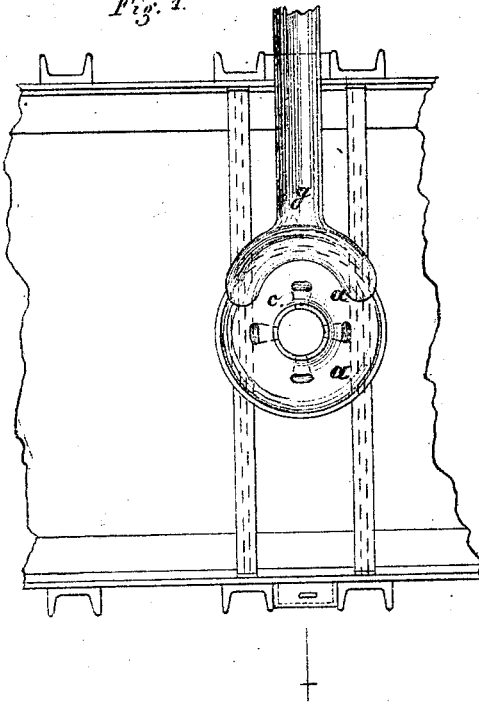
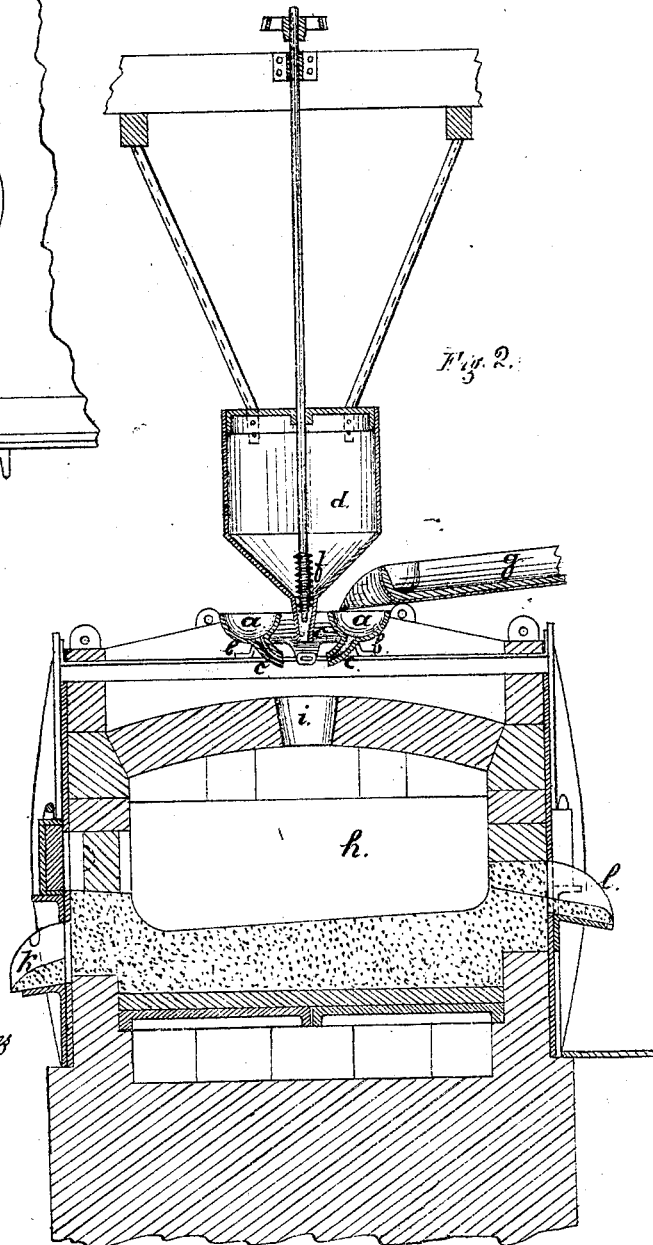


Fig. 2.



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IMPROVEMENT IN THE MANUFACTURE OF IRON AND STEEL.

Specification forming part of Letters Patent No. 114,277, dated May 2, 1871.

To all whom it may concern:

Be it known that I, ZOHETH S. DURFEE, formerly of Troy, but now of the city and county of New York, in the State of New York, have invented certain Improvements in the Manufacture of Iron and Steel, and of alloys of various metals, and in the apparatus connected therewith, of which the following is a specification:

The first part of my invention relates to the manufacture of iron and steel by mixing molten pig-iron and oxides of iron, and sometimes adding other matters, and, after the mixture, treating the compound in suitable furnaces; and the accompanying drawing shows my apparatus for carrying out this and similar processes.

An annular trough, *a*, supported on legs *b b*, is placed on the top of a furnace, or over an ingot-mold into which it may be desired to run the compound to be made and treated. This trough is provided with several spouts, *c c*, which converge toward each other. Above the trough is a hopper or large funnel, *d*, whose outlet, *e*, is immediately over the focus of the streams of metal to be run out of the spouts *c c*, and this hopper may be supported by braces attached to the trough *a*, or as shown in the drawing herewith, or in any convenient manner. In the hopper is a feeding-screw, *f*, which is intended to work so that no ore will run through the pipe *e*, except when the screw is turned.

In operating my process a suitable quantity of pulverized ore is placed in the hopper and the screw put in motion. Molten pig-iron is then run into the trough *a* by the runner *g*, or from a casting-ladle; and as the ore is delivered from the pipe *e* it is taken by the convergent streams of iron from the spouts *c c* and carried down into the furnace or mold thoroughly and evenly mixed with the iron.

By varying the speed of the screw or flow of iron, the quantity of ore mixed with a given weight of iron can be regulated nearly at will.

If the compound is run into ingot-molds, the ingots so made may be treated in ordinary heating-furnaces, or otherwise, as may be desired; but I prefer to run the compound

directly into a furnace, as at *h*, through an opening in the roof *i*, said opening being closed after the furnace is charged. The compound can then be balled up and worked as puddled balls now are, or it can be melted into steel and tapped out at the tap-hole *k*.

When I propose to melt the compound into steel, I allow a portion of the fluid iron to run through the trough *a* down upon the bed of the furnace before I start the screw to feed the ore, so as to have a bath of carburized metal for the compound to fall into.

The furnace, which by preference should be a gas-furnace, must be heated previously to running in the metal; and in the course of the process I would introduce along with the ore such fluxes or purifying substances as might advantageously be used therein; and the character of the steel can also be varied by adding, during the melting process, scraps of iron or steel, spiegel-eisen, or other substances, as is now often practiced in melting steel.

I do not give any proportions of iron and ore to be used in this manufacture, as they will depend upon the richness of the pig-iron in carbon, and the purity and richness of the ore, as well as upon the character of the product required; and the mixtures can readily be made for any required product by those familiar with the metallurgy of iron and steel.

My apparatus and process are also adapted to the manufacture of alloys of iron and manganese, copper and manganese, iron and chromium, copper and chromium, and other alloys; in all which manufactures I prefer to add the least refractory or most readily obtainable metal in a fluid state to the most refractory or rarer metallic substance as it is found in ores or other compound state, substantially as just described, in the manufacture of iron and steel.

In all these cases carbon in some form may be added to the pulverized ores to combine with any excess of oxygen in the mixture, and any desired fluxes may also be used; but I do not now propose to specify any particular mixtures.

The furnace *h* should have doors on both sides for working it, and to admit of repair.

ing the bottom easily; and a tap-hole, *l*, is also desirable for taking off any surplus slags.

What I claim as my invention is—

1. The manufacture of iron and steel, and of various metallic alloys, by the combined apparatus and processes, substantially as herein described.

2. The annular trough and feeding-hopper,

combined together and operated either with an ingot-mold or a furnace, substantially as described herein.

ZOHETH S. DURFEE.

Witnesses:

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