

UNITED STATES PATENT OFFICE.

OGDEN BOLTON, JR., OF PITTSBURG, PENNSYLVANIA.

IMPROVEMENT IN THE MANUFACTURE OF MANGANESE, FERRO-MANGANESE, AND SPIEGELEISEN.

Specification forming part of Letters Patent No. **141,419**, dated August 5, 1873; application filed March 24, 1873.

To all whom it may concern:

Be it known that I, OGDEN BOLTON, JR., of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in the Manufacture of Manganese, Ferro-Manganese, and Spiegeleisen; and do hereby declare the following to be a full, clear, and exact description thereof, such as will enable others skilled in the art to make and use the same.

The articles known as ferro-manganese and spiegeleisen are extensively used in the manufacture of steel and the higher qualities of wrought-iron, and the ferro-manganese, as heretofore prepared, has been made chiefly by melting manganese, pulverized carbons, and pig-iron or spiegeleisen, while the spiegeleisen is made chiefly in the blast-furnace.

By my improvement I produce the manganese in a condition pure, or nearly so, without melting, and employ it in the making of ferro-manganese and spiegeleisen, in the manner presently to be described, so as to produce a better quality of product in less time and at less expense than by the processes heretofore in use.

In my improved process I take of the ordinary oxide of manganese about ten parts, by weight, to three parts of solid carbon, such as charcoal, coke, or anthracite coal, or the equivalent thereof of gaseous carbon. Both these ingredients are preferably pulverized, and, when mixed thoroughly, are inclosed in cases or boxes of suitable material, either metallic, or made of silicious or aluminous earths. These cases or boxes may be of any suitable size for containing any desired charge. They are preferably made close, except at one end, where the charge is introduced, and such open end I close up with a covering of charcoal, clay, or other like substances, such as will permit the escape of the gases evolved in the process of reduction, but which will prevent the entrance of atmospheric air in injurious quantities.

Instead of this covering of charcoal and clay, a loose metallic sheet may be advantageously employed with a sand covering around the edges, in which case, as the bulk of the charge lessens in the process of reduction, the loose plate will follow it down. These boxes or cases are then charged into any suitable heat-

ing furnace, such, for example, as the ordinary reverberatory furnace, and are there raised to temperature less than melting heat—say, a bright red or bare yellow—and after the contents are well heated through they are continued subject to this heat for about from twelve to fifteen hours, according to the quantity. The manganese employed in this process may be either protoxide or peroxide. In the process described the carbon unites with the oxygen and passes off as carbonic-acid gas or carbonic oxide, and gives as a product manganese, nearly or quite pure.

The product thus obtained I employ to secure spiegeleisen or ferro-manganese, in the following manner: I melt the pig-iron in the ordinary way, but, preferably, in a reverberatory furnace, and charge into it about twelve per cent. of the manganese produced, as above, and melt the manganese therein. Where the manganese is reduced in metallic cases it may be charged into the molten metal in the box either hot or cold; or, as I sometimes do, it may be compressed into lumps or blooms of convenient size for handling, and charged in that form into the molten pig metal. This proportion of ingredients I run off, when melted, into ingots as spiegeleisen, or tap it directly into the Bessemer converter or open hearth, where it is used as spiegeleisen, in the ordinary way.

To produce ferro-manganese I simply charge into the molten pig metal a larger proportion of manganese, such as will give in the molten product the desired percentage of manganese—say, twenty-five or thirty per cent., more or less—and run off into ingots or tap off into the converter or open hearth the molten product, as before specified. But, if so preferred, the pig metal and reduced manganese may, in the proportions above indicated, be melted together in the reverberatory furnace, though less advantageously.

The manganese, as produced by the process first described, I also use advantageously by charging the same while inclosed in its case or box; or, when compressed, into blooms directly into the molten steel of the Bessemer converter or the open hearth. The manganese counteracts red-shortness in the steel, apparently by uniting with the free oxygen or me-

tallic oxides which may be in the steel, and in this mode of using it is particularly useful in the manufacture of boiler-plate steel. From one half to one per cent. of manganese will ordinarily give the best results in this use.

In connection with my process as above described I do not limit myself to a pure, or nearly pure, article or manganese, as it may be desirable to use, in connection with the manganese, a greater or less percentage of carbon. When the pure, or nearly pure, manganese is required, I proportion my carbon so nearly as to all carried off while reducing; or I use carbonaceous gases; but, where it is desired to have carbon with the manganese, I increase the proportion of carbon to such an extent that when the manganese is reduced, or reduced as nearly as possible in practice, there will be still the desired proportion of carbon left, though I consider it still better to use a highly-carbonized pig-iron, either in the case or separate, as a part of the charge for a bath of molten steel where manganese and carbon are both to be introduced therein.

The process described I employ advantageously in connection with the metallic ores, which, in their native state, contain the oxide of manganese and oxide of iron. In such cases I introduce with the oxide of manganese and

oxide of iron a sufficient amount of carbon to carry off, when heated, the oxygen, by which I secure the product of metallic iron and metallic manganese mixed, which product I then use in the manner already indicated.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The reduction of manganese in close boxes or cases in a suitable furnace at less than a melting heat, with or without the introduction of iron, substantially in the manner set forth.

2. The manufacture of spiegeleisen and ferro-manganese by charging the unmelted or metallic manganese produced, as set forth, either in boxes or in blooms into pig metal previous to or after melting, substantially as in the manner set forth.

3. The charging of metallic manganese, either in cases or blooms into a bath or molten steel, substantially in the manner set forth.

In testimony that I claim the foregoing as my invention I hereunto affix my signature this 17th day of March, 1873.

OGDEN BOLTON, JR.

Witnesses:

W. N. PAXTON,
F. B. NIMICK.