

# UNITED STATES PATENT OFFICE.

JAMES H. ETHERIDGE, OF CHICAGO, ILLINOIS.

## IMPROVEMENT IN THE MANUFACTURE OF SPIEGELEISEN.

Specification forming part of Letters Patent No. **169,793**, dated November 9, 1875; application filed October 1, 1875.

*To all whom it may concern:*

Be it known that I, JAMES H. ETHERIDGE, of Chicago, in the State of Illinois, have invented an Improved Process of Manufacturing Spiegeleisen, of which the following is a specification:

Spiegeleisen is an alloy of iron, manganese, and carbon; and has heretofore been manufactured by reduction in an open furnace. The practical requisites of good commercial spiegeleisen are manganese about eleven per centum, and carbon about four per centum, and a highly-crystalline structure, with large and smooth cleavage-planes.

I am aware that iron, manganese, and oxide of iron in the presence of carbon have heretofore been fused together, but that has been done in an open furnace.

In the methods of reduction in open furnaces heretofore proposed it has been necessary either to employ the natural manganiferous iron ore, which, so far as known, is confined to a few localities, and is very costly, or to use an excessive quantity of carboniferous fuel, one of the effects of which is the deposition of uncombined carbon in the form of graphite. It has also been impossible to so control the process that an alloy with any desired and predetermined proportions of iron, manganese, and carbon could be produced, because it has been found that, as the per centum of manganese increased the per centum of carbon decreased, and crystalline structure disappeared. All of these objectionable conditions or disadvantages are obviated by my invention, which consists in fusing the iron and manganese, in the presence of carbon, in a chamber closed against the admission of atmospheric air.

My process does not require the employment of manganiferous iron ore, nor of prepared iron, nor any excessive quantity of carboniferous fuel, and an alloy can be produced with any predetermined proportion of iron, manganese, and carbon, because in such a closed

chamber there can be no material combustion and loss of the carbon. I therefore prepare a proper chamber or crucible, of some sufficiently refractory substance, to which heat may be applied exteriorly, and the proper charge, composed of iron, manganese, and carbon, separately prepared, with a proper fluxer, is placed therein. These substances are broken or powdered, and the chamber is packed full to exclude, as far as possible, the atmospheric air, and the opening is then closed against the admission of atmospheric air during process of reduction. Heat is then applied until the desired fusion takes place, after which, the charge being withdrawn, it is found to consist of spiegeleisen and slag.

Without confining myself to those proportions, I will say that I have in practice employed pig-iron, manganese ore of about forty-two per centum manganese, and charcoal in equal proportions in bulk, to produce spiegeleisen containing four and forty-eight hundredths per centum of carbon, eleven and twenty-eight hundredths per centum of manganese, and the remainder substantially iron. Double the proportion of manganese ore and carbon yields a spiegeleisen containing about nine per centum and twenty-three per centum, respectively, of carbon and manganese. Oxide of iron answers admirably well for a fluxer.

Having described my invention, what I claim as new is—

The process of producing spiegeleisen, with a definite per centum of manganese and carbon, by fusion of iron and manganese in the presence of carbon, and a flux in a chamber closed against the admission of atmospheric oxygen, substantially as described.

JAMES H. ETHERIDGE.

Witnesses:

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