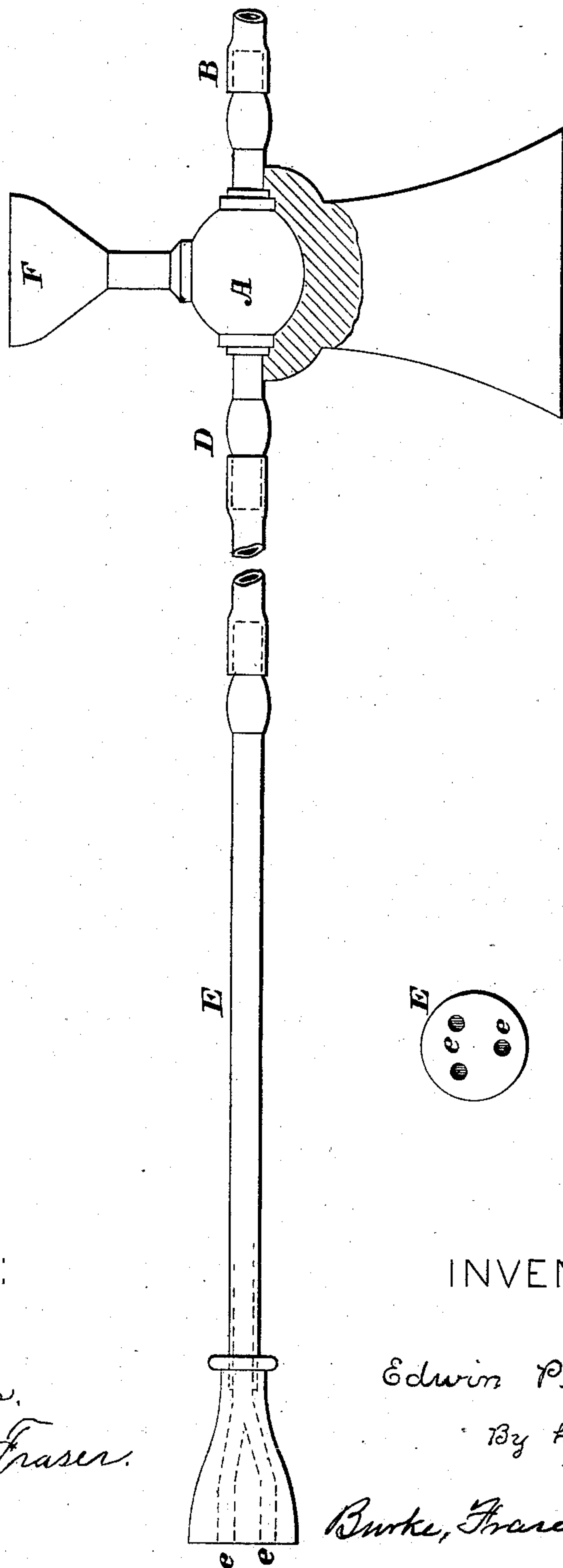


E. PETTITT.  
Manufacture of Iron.

No. 219,410.

Patented Sept. 9, 1879.



ATTEST:

*Wm. S. Brown,*  
*George H. Fraser.*

INVENTOR:

*Edwin Pettitt,*  
*By his Attorneys,*  
*Burke, Fraser & Connett.*

# UNITED STATES PATENT OFFICE.

EDWIN PETTITT, OF CHELTENHAM, ENGLAND.

## IMPROVEMENT IN MANUFACTURE OF IRON.

Specification forming part of Letters Patent No. **219,410**, dated September 9, 1879; application filed February 7, 1879; patented in England, July 6, 1878.

*To all whom it may concern:*

Be it known that I, EDWIN PETTITT, of Cheltenham, England, civil engineer, have invented or discovered certain new and useful Improvements in the Manufacture of Iron, of which the following is a specification, reference being had to the accompanying drawing, forming a part of the same, and illustrating the apparatus employed for carrying my invention into practice.

My invention relates to a method of producing fibrous or wrought iron from cast-iron; and consists, essentially, in incorporating thoroughly with the molten iron, by means of an air-blast, finely-powdered glass, glassy slag, or other similar substance that will not decompose and combine with the iron, which substance will, in the main, rise to the surface of the metal, leaving filmy traces through its substance, whereby the iron is rendered fibrous.

The object of the invention is to produce from cast-iron a fibrous iron that may be rolled, welded, and otherwise similarly wrought, the invention being, in fact, an improvement on the well-known process of puddling.

In puddling iron to produce wrought or fibrous iron, it is well known that the fibrous character is imparted by the mechanical admixture of cinder with the mass; otherwise the resulting metal would not be fibrous.

My improvement consists in incorporating with the charge of molten iron finely-powdered foreign matter, such as glass, glassy slag, feldspar, and similar substances that do not decompose and chemically combine with the iron, by means of an air-blast, whereby the said matters, in a state of fine subdivision, may be brought into contact with every particle of the iron. These substances (as well as the earthy matters contained in the iron at first) rise, in the main, to the surface of the molten iron as slag, but not, however, entirely, as they leave behind, in the body of the iron, traces or tracks of their vitrified substance, thus blown in and through it, which eventually leave the iron in a finely-fibrous condition.

In the process of blowing, the iron is converted into a cellular mass, honey-combed, and as porous as pumice; and it is while it is in this condition that these cells become coated with films of the vitrified powder blown into

the mass. By the time the process is complete the iron shrinks down, becomes homogeneous, closes up the myriads of cells, and by so doing incloses the filmy coatings of the cells. This coating, as before stated, is small in quantity, but is sufficient to determine the character of the iron, and renders it capable of being welded, forged, or rolled, either hot or cold.

In some cases, and especially where large quantities of metal are to be treated—say ten or twenty tons—I incorporate the foreign ingredients with the molten iron in a converter or other suitable receiver, and after the process is completed I pour the molten metal into ingot-molds, to be subsequently reheated, hammered, and rolled.

In other cases I incorporate the powdered foreign matters with the iron in a puddling-furnace, employing the blower precisely as in the former case; and when the process is completed the iron is balled up in lumps of suitable size, and taken to the hammer to be forged into billets.

The rationale of my process is based upon the old process of puddling, but applied in a new manner, which produces a much better metal at a reduced cost. I consider it, in fact, a combination of the Bessemer process with the puddling process.

I am aware that ground iron ore, anthracite coal, and similar substances which will decompose under the influence of the heat and combine with iron, so as to chemically purify it and alter its nature, have been blown into the same in a finely-divided condition; but these are for purifying alone, and the resultant is cast-iron, and not fibrous or wrought iron, as produced by my improved method.

I may, however, combine such purifying substances with the substances I employ, so as to purify the iron at the same time that it is rendered fibrous.

In the apparatus I prefer to employ in carrying out my improved manufacture, as shown in the drawings, A is a hollow chamber, of any convenient size or form, communicating at one end, through the pipe B, with the main blast-pipe from the blower, and at the other end, by the pipe D, with the converter; or, if any other form of receiver or furnace is employed, the pipe D is provided with a hollow instru-



ment, E. This instrument consists of a pipe or tube having at its outer end a nozzle, with one or more outlets, *e e*. This nozzle I prefer to make of fire-clay or soft glazed ware.

F is a hopper or funnel, mounted upon the chamber A, communicating therewith, and arranged to hold the charge of powdered foreign matter to be introduced into the fluid metal by the blast.

If a cold blast be employed, the connecting-pipes B and D may be made of rubber or other flexible material; but if a hot blast be used, these connections should be of metal.

If a converter be employed, the chamber A may be fixed at any point between the main blast-pipe and the said converter.

When a blast of air is sent through the apparatus, the foreign material in the hopper F is drawn down or falls down, and is conveyed into the mass of molten iron, as above set forth.

If it is desired to produce a pure, or nearly pure, iron, I use a perfectly-vitrified glass or slag, as free from metallic oxides as possible.

The ordinary black bottle glass or cullet, or a gray, tough, and glassy blast-furnace slag, are the cheapest materials and the best for the purpose.

The whole quantity of such foreign matters so mixed and incorporated with the metal should not be less than one-half of one per

cent. nor more than six per cent. of the weight of the charge of iron operated upon.

When a pure, or nearly pure, iron is produced in the manner herein set forth, it can, while undergoing the operation, be changed into a metal of a harder or more steely nature by the admixture of a proportion of spiegel-eisen or other iron, as is well understood.

Having thus described my invention, I claim—

The method of making fibrous or wrought iron from cast-iron herein described, which consists in blowing into or through the charge of molten iron finely-powdered glass or glassy slag, or other similar substance, which will rise, in the main, to the surface of the metal, but will leave non-decomposed filmy coatings or traces throughout the mass while it is in a cellular condition, thus rendering it fibrous and capable of being wrought, hammered, or welded, substantially as specified.

In witness whereof I, the said EDWIN PETTITT, have hereunto set my hand this 28th day of December, 1878.

EDWIN PETTITT.

Witnesses:

ALEXANDER LORELL,  
2 Wellington Place, Cheltenham.

ROBERT A. H. BAYLIS,  
7 Tivoli Terrace, Cheltenham.