

FRANCIS D. TAYLOR.

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Improvement in the  
Manufacture of Iron.

PATENTED AUG 1 1871

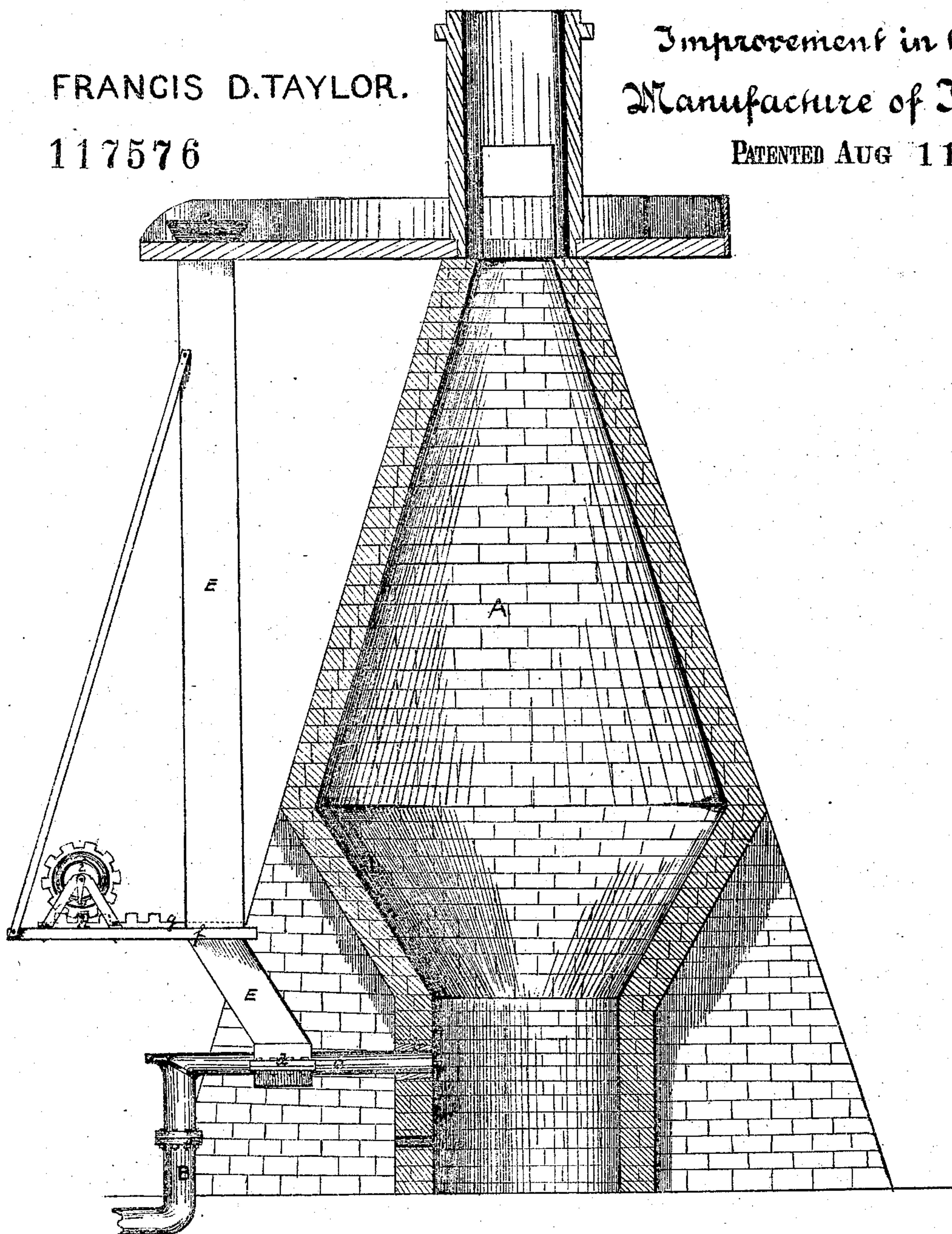


FIG 1.

Witnesses:

*Thos. Kern*

*R. C. Wrenshall*

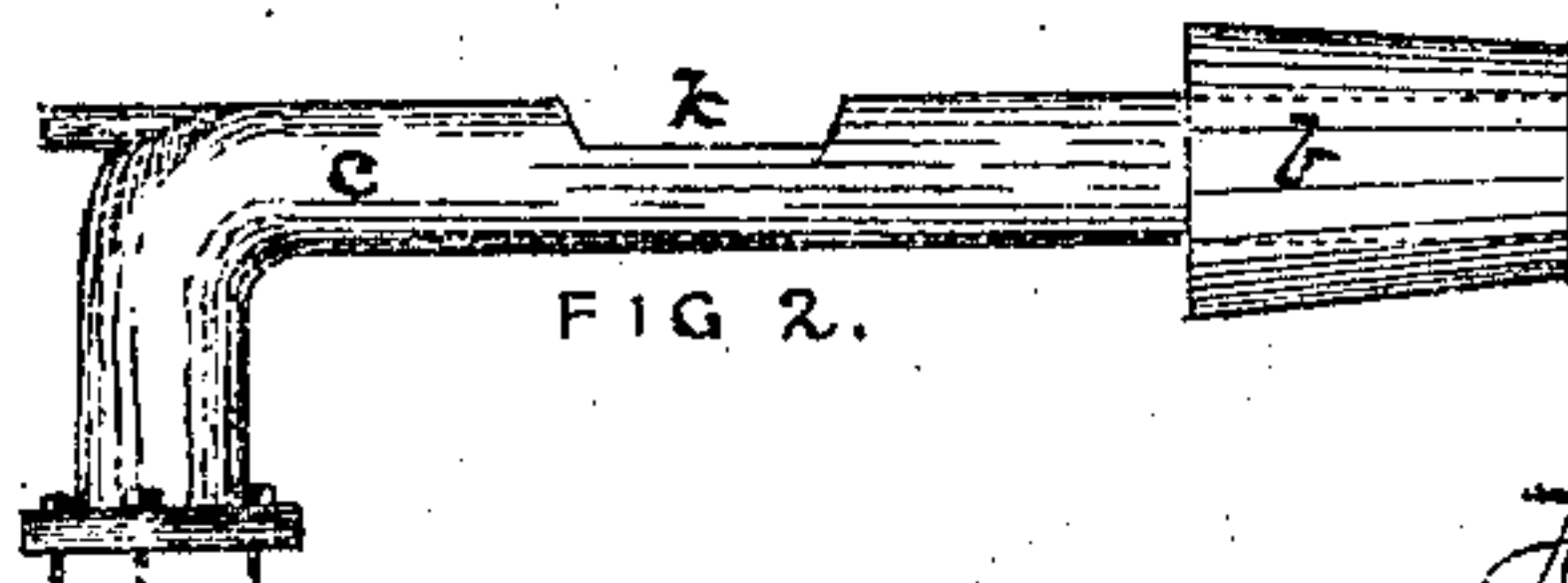


FIG 2.

Inventor:

*Francis D. Taylor,*  
*by Bakerwell & Christy*  
*his Attys.*



# UNITED STATES PATENT OFFICE.

FRANCIS DANIEL TAYLOR, OF BRADY'S BEND TOWNSHIP, PENNSYLVANIA.

## IMPROVEMENT IN THE MANUFACTURE OF IRON.

Specification forming part of Letters Patent No. 117,576, dated August 1, 1871; antedated July 21, 1871.

*To all whom it may concern:*

Be it known that I, FRANCIS DANIEL TAYLOR, of Brady's Bend township, in the county of Armstrong and State of Pennsylvania, have invented a new and useful Improvement in Manufacture of Iron; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention consists in the introduction of pulverized iron ore or other metallic oxides into a blast-furnace, for the manufacture of iron from ore, together with the blast of hot or cold air through the tuyere or tuyeres above the surface of the molten metal in the hearth and below the burden, for the purpose of producing a more intimate admixture of the pulverized ore with the molten metal than can be otherwise obtained, and also of mixing the ore with the melted metal while it is exposed to a high heat, and thus, by preventing the immediate chilling of the metal, consequent on its admixture with the ore, securing a more perfect chemical action at the time of admixture, and avoiding, to a great degree, the necessity of future treatment for the decarbonization of the pig-metal.

In order to enable others skilled in the art to use my invention, I will proceed to describe the apparatus which I employ and its mode of application.

In the accompanying drawing, Figure 1 is a sectional representation of a blast-furnace with my apparatus for introducing pulverized ore attached; and Fig. 2 is a perspective representation of the belly-pipe, showing the opening to receive the pulverized ore.

My improvement is designed to be used in connection with a blast-furnace of any ordinary construction, the object being to decarbonize the metal as far as is practicable without bringing it to a solid state or losing its fluidity, at the same time and in the same furnace in which it is reduced or brought to a metallic state from the ore. The blast-furnace I need not therefore more particularly describe.

In the drawing, A is the blast-furnace. *b b* are tuyeres, through which the blast of hot or cold air is introduced into the bosh of the furnace by means of a blast-pipe, B, of ordinary construction. At a convenient point in the upper side of the belly-pipe *c* I make an opening, *k*, to receive the pulverized ore which is to be blown into the blast-furnace. Around this part

of the belly-pipe I fit a casting, *d*, which forms the seat of the feed-pipe E, which is secured by means of bolts, or in any convenient manner.

On the seat *d* I set the feed-pipe E, which extends upward to a sufficient height to give pressure enough from the column of pulverized ore to prevent the escape of the blast in that direction, or the blowing out of the ore at the top of the pipe. This pipe is furnished at top with a hopper, *e*, through which the pulverized ore is supplied to the feed-pipe E. In order to regulate the supply of ore to the blast-furnace or stop it altogether, if desired, I attach to the feed-pipe E, above the belly-pipe, a frame, *f*, furnished with a slide, *g*, which enters the feed-pipe and forms a gate to prevent or regulate the supply of ore. To this gate *g* is attached an arm, *h*, furnished with cog-teeth, into which works a pinion, *i*, worked by a winch or crank, by turning which the gate *g* may be opened more or less, or entirely closed.

When it is desired to treat the iron in the blast-furnace with oxide of iron, iron ore, or other metallic oxides, it is only necessary to supply the feed-pipe with the oxide previously sufficiently pulverized, and open the gate *g*, when the pulverized oxide will drop down gradually into the belly-pipe and be carried immediately by the face of the blast through the tuyeres into the bosh of the furnace, above the surface of the melted metal in the hearth. The ore thus comes in contact with the melted metal as it runs down from the burden above, and also mixes with the metal in the hearth, which causes and keeps up a fermentation of the metal, causing the continual escape of the carbon from the metal by its union with the oxygen of the ore at high heat, while the iron in the ore is at the same time reduced to a metallic state, increasing the amount of metal in the hearth. This supply of ore must be regulated so as to produce the required degree of decarbonization of the pig-metal, and not be carried to such an extent as to cause the metal to solidify or become so thick and pasty as to lose its liquid condition. The metal thus purified and greatly decarbonized is run out into masses of nearly decarbonized iron, which, owing to the treatment thus given to it in the blast-furnace, will need but little after treatment before being fit for rolling into muck bar.

This method of treating iron in the blast-fur-



nace has the further advantage that the same furnace, without altering its burden or charge, may be made to yield either common pig-metal or metal more or less purified and decarbonized. If pig-metal is required, the gate *g*, which admits the pulverized ore, is closed, when the furnace becomes an ordinary blast-furnace; but by simply opening the gate the yield becomes purified and decarbonized metal.

The peculiarity of my improvement consists chiefly in treating pig-metal at the time of its reduction from the ore, when in a very fluid condition, and at a sustained high heat, with pulverized oxides combined with a blast of air, in contradistinction from treating melted metal with oxides in a separate vessel, and without any other heat than that of the metal itself, which latter treatment immediately chills and solidifies the metal, and retards and obstructs the chemical action of the oxides on the highly car-

bonized iron, and prevents the completion of the desired change until the mass of pig-bloom is subjected to further heat in another furnace and by separate treatment.

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

The combination, with the belly-pipe of the tuyere of a blast-furnace, of a supply-pipe opening into the belly-pipe and of such height as that the pressure of the column of oxide shall prevent the blowing out of the contents of the pipe otherwise than through the tuyere into the furnace, substantially as described.

In testimony whereof I, the said FRANCIS D. TAYLOR, have hereunto set my hand.

FRANCIS DANIEL TAYLOR.

Witnesses:

J. N. STEWART,  
JOHN GLENN.