BROWN & McKEE.

Refining Iron.

No. 27,688. Patented Apr. 3, 1860.

Fig. 2.

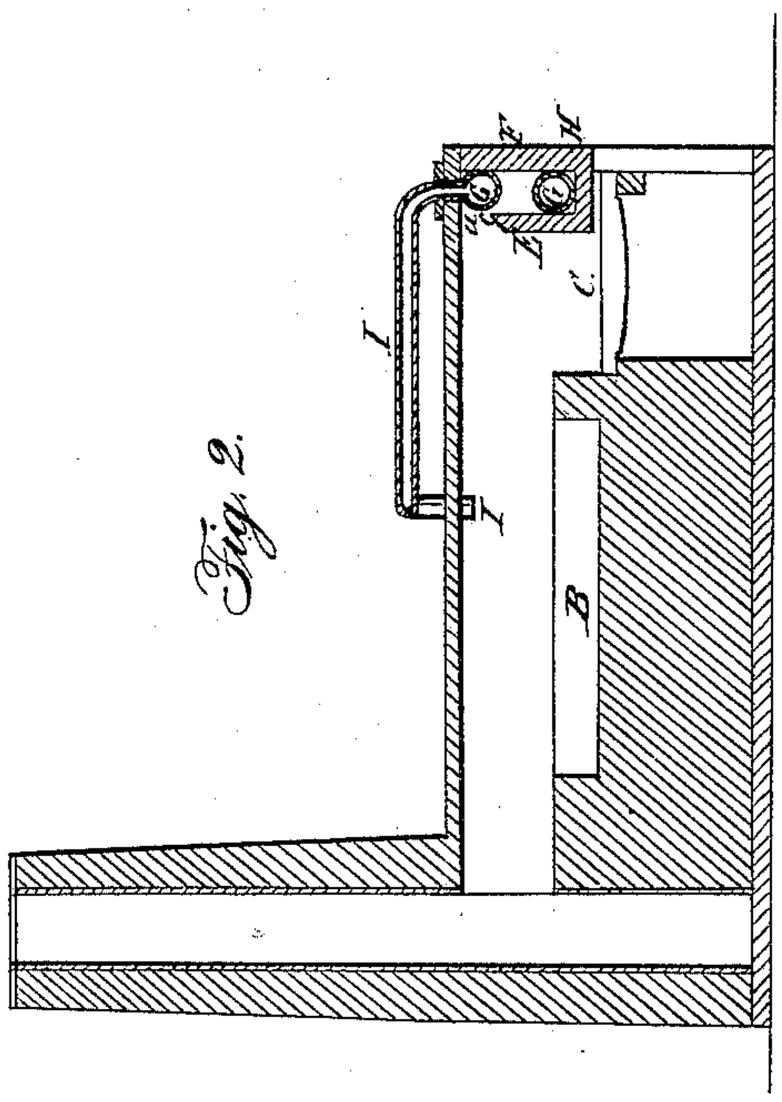


Fig. 3.

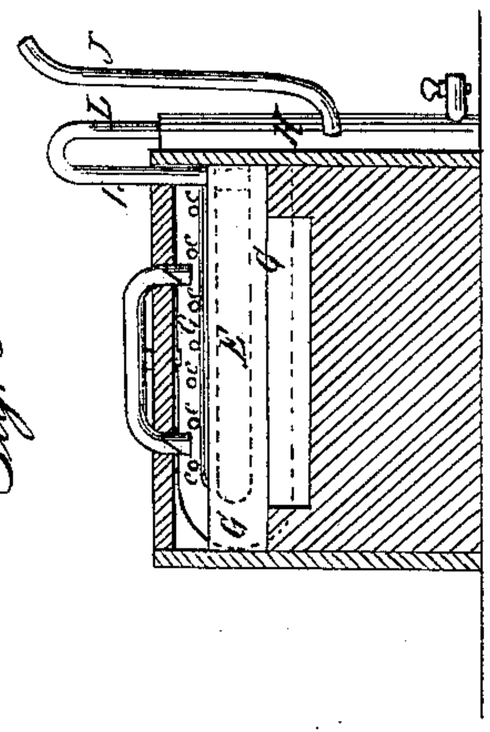
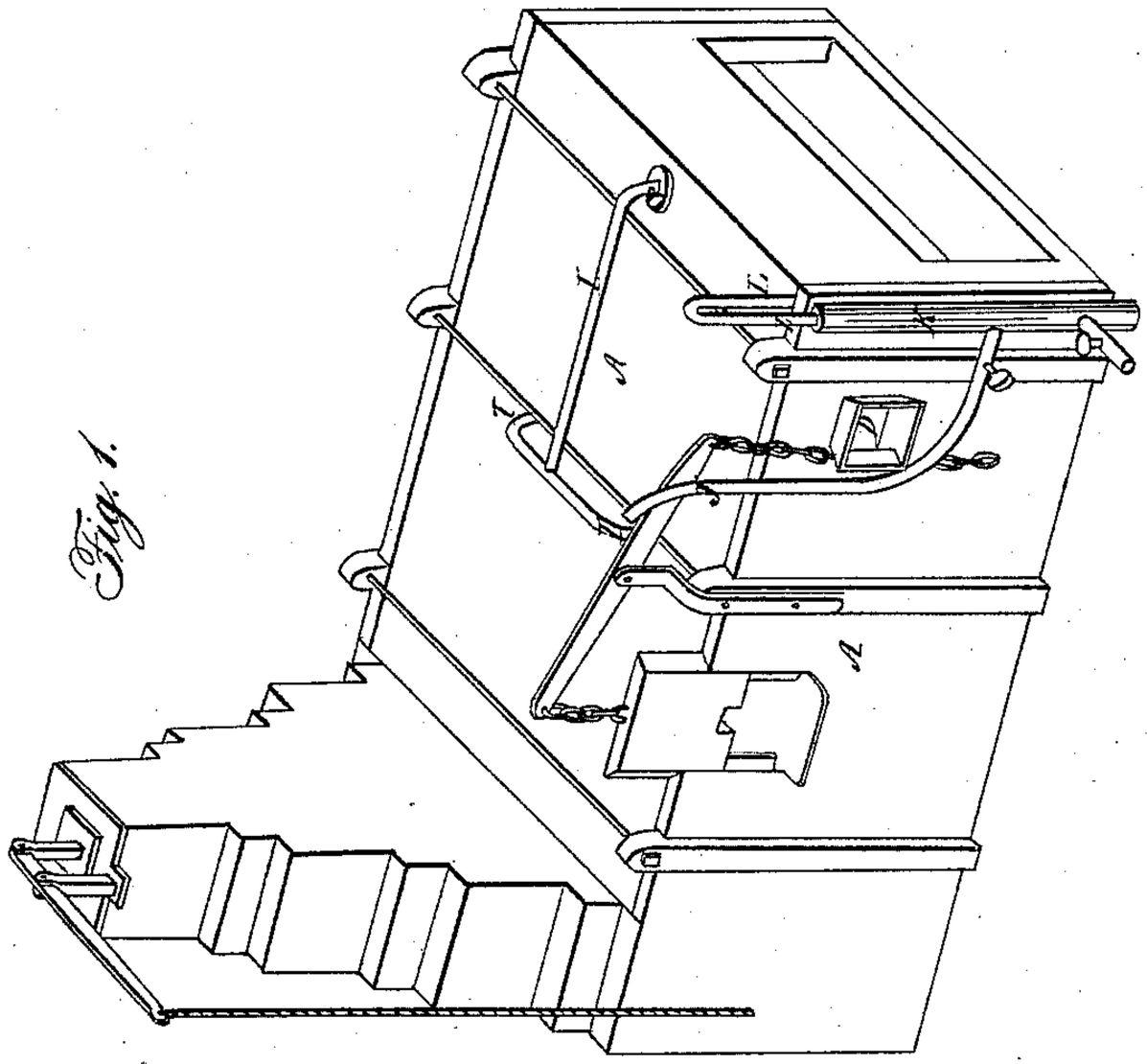


Fig. 1.



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UNITED STATES PATENT OFFICE.

W. G. BROWN AND F. McKEE, OF BIRMINGHAM, PENNSYLVANIA.

IMPROVEMENT IN THE MANUFACTURE OF IRON.

Specification forming part of Letters Patent No. **27,688**, dated April 3, 1860.

To all whom it may concern:

Be it known that we, WILLIAM G. BROWN and FREDERICK MCKEE, of Birmingham, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in the Application of Superheated Steam to the Manufacture of Iron; and we do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, making a part of this specification, and which represent an ordinary puddling-furnace, though we propose to apply our invention to the manufacture of iron from the ore, and with or without a blast, and also in converting ore or pig-iron into malleable iron.

Of the accompanying drawings, Figure 1 represents a perspective view of a puddling-furnace. Fig. 2 represents a longitudinal vertical section through the same; and Fig. 3 represents a transverse vertical section near the steam-pipes in which the steam is superheated, and from which it passes (or rather its constituents) in jets through or in contact with the carbon of the burning mass into the puddling-hearth.

To enable others skilled in the art to make and use our invention, we will proceed to describe the same with reference to the drawings, first premising, however, that we are aware that attempts have been made to use superheated steam in connection with the manufacture of iron, but with such waste of the steam or destruction of the pipes in which it was superheated as to make its use in no wise economical, if even practical. We do not therefore claim, broadly, the use of superheated steam in the manufacture of iron; but we do claim the manner in which we superheat the steam and jet it into the iron or ore with which it or its constituents are to chemically act or combine; and to illustrate the characteristics of our invention, we will proceed to describe the same in connection with a puddling-furnace, though, as before stated, we contemplate the same application to blast or cupola furnaces.

A, Fig. 1, represents a puddling-furnace supplied with the usual appliances to such furnaces, as shown in said figure.

B in Fig. 2 shows the puddling-hearth, and C the fire-box or furnace, which is supplied with coal from or through the opening D, Fig. 1.

E is a bridge-wall at one end or side of the furnace, as shown in Fig. 2, between which and the end wall, F, of the furnace is placed a pipe, G, which is bent at one end, so as to return back over its lower portion, as shown in Fig. 3, and thus form two layers (as it were) of pipe, but formed of one piece or united into one. There is a bottom wall, H, also under the pipe G, which, with the sides and top, form almost a separate chamber. The bridge-wall E, however, does not extent up to the top of the furnace, but leaves a space, *a*, between it and the top portion opposite, or in which space is placed the upper portion of the pipe G, with its steam-openings *c c c*, &c., facing the furnace, so that the jets of highly-heated steam escaping therefrom shall pass through and over the heated products of combustion in the furnace into the metal upon or in the hearth B. A pipe, I, also extends from the upper portion of the pipe G to a point over the hearth of the furnace, and this pipe conveys the superheated steam from G and jets it into the iron on the hearth. The walls E H, though protecting the lower portion of the pipe G from the intensity of the fire, are still highly heated, as they are in direct contact with the fire, and by conduction they impart a high heat to said lower portion, which dries and superheats the steam passing through or contained in it. The upper portion, however, of said pipe G is exposed directly to the flame or heat of the furnace through the opening *a*, as well as or in addition to that which it receives by conduction from the walls E H, and when the steam reaches this portion of the pipe it is heated almost red hot, and is possibly, by the high heat to which it is subjected, converted into its constituent elements and its character of steam entirely changed, and in this condition it is thrown or carried through the gaseous products of combustion in the furnace, and thence into the puddling-hearth; or it may be taken over by the pipe I, as above described, or both.

We have proven by experiment that steam cannot be economically superheated in a coil of pipe, for two reasons: First, the steam expanded by the heat seems to cling to the pipes, and will not pass into the furnace; and, secondly, the destructive character of the constituents of the steam upon the red-hot pipes. Now, we introduce and superheat our steam as follows: J is a steam-pipe leading from a boiler in which steam is generated at any of the ordinary pressures—say eighty pounds—though it

is often at one hundred pounds. The steam from this pipe passes into the chamber of the pipe K, and from thence by a small pipe, L, into the lower part of the pipe G, which latter pipe is much larger than the pipe L. This gives the steam, when heated in G, an opportunity to expand, which also induces it to pass on up and into the upper portion of G, where it receives its greatest heat, and escapes there through the jet-holes *c*. By conveying steam from a smaller to a larger pipe to be superheated, we avoid any and all sluggishness of the high-heated steam, its motion being continuous, and thus we save the red-hot pipes from destruction by the oxygen in the steam.

The pipe G, in which the steam is superheated, may be placed in any part of the furnace that will admit of its being similarly protected, as shown; and so, also, that the jets will pass over, through, or in contact with the heated products of combustion in the furnace before they reach the hearth where the iron to be treated is placed.

The superheated steam mingled with the gaseous products of the coal not only promotes combustion, but also chemically and mechanically combines with the iron, so as to divest it of all the earthy impurities that tend to impair its tenacity.

Having thus fully described the nature and object of our invention, what we claim therein as new, and desire to secure by Letters Patent, is—

1. Carrying the steam to the pipe G, in which it is to be superheated, through a pipe, L, smaller in bore than the bore of the pipe G, substantially in the manner and for the purpose set forth.

2. So arranging the pipe G with regard to the furnace as that while it is heated by the fire in the furnace and shall jet its heated contents through or over the burning products therein, it shall be duly protected from the intensity of said fire, substantially as set forth.

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