

W. BUSHNELL.

Manufacture of Iron.

No. 135,886.

Patented Feb. 18, 1873.

Fig. 1.

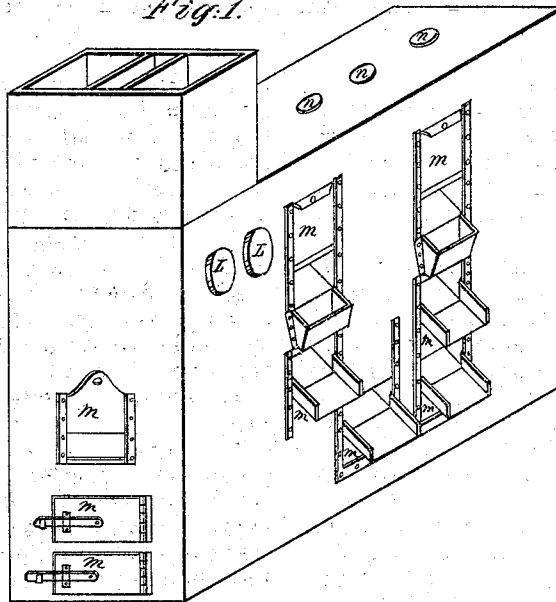


Fig. 3.

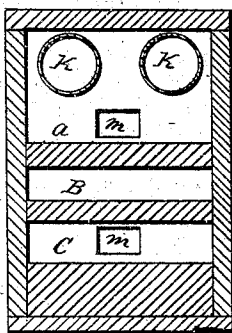


Fig. 2.

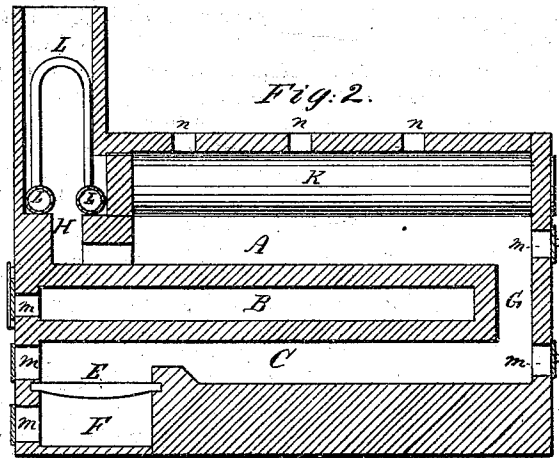
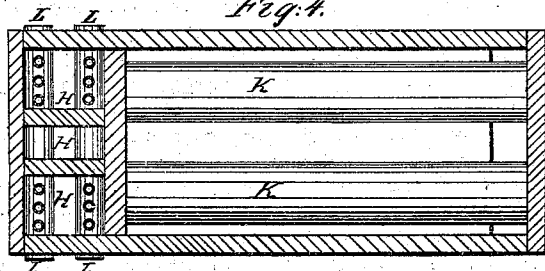


Fig. 4.



Witnesses

Mortimer Bushnell
Theodore D. Bushnell

Inventor

William Bushnell

UNITED STATES PATENT OFFICE.

WILLIAM BUSHNELL, OF NEW YORK, N. Y.

IMPROVEMENT IN THE MANUFACTURE OF IRON.

Specification forming part of Letters Patent No. 135,886, dated February 18, 1873.

To all whom it may concern:

Be it known that I, WILLIAM BUSHNELL, of the city of New York, N. Y., have invented a new and useful Improvement in Puddling-Furnaces for making blooms and bar-iron direct from iron ore, of which the following is a specification:

In the entire range of the manufacture of iron there is nothing more important, or which has received less real practical attention, than the making of blooms and bar-iron direct from the ore in puddling-furnaces, by the use of raw mineral coal, and hence the aim and object of this invention is to accomplish that desirable result. That it cannot be successfully accomplished by the use of the ordinary puddling-furnaces, upon a single bottom, is perfectly apparent to every mind conversant with the requisites for roasting, purifying, and deoxidizing ordinary iron ores, and for the simple and substantial reason that the process would be too prolonged to be consistent with economy, even if it could be done at all in that way.

My invention and improvement consist, mainly, in the arrangement of the chambers or compartments of the furnace, in combination with the boilers and hot-blast pipes, and the following is presented as a clear and full description thereof, in which—

Figure 1 in the accompanying drawing is a perspective view of the exterior form of the furnace, showing the charging holes or openings N N N on the top of the furnace; the side doors in chambers A, B, and C, lettered M M M M M; and the door leading into chamber B on the end, together with the grate and the ash-pit doors, also lettered M M M; and likewise the divisions in the chimney, the middle one serving as a flue from the boiler-chamber or chambers A, and the two outside ones being the compartments in which the hot-blast pipes are located. Fig. 2 represents a vertical section of the furnace through its center, longitudinally, and showing the arrangement of chambers A, B, and C, with their flues G and H, one of the boilers K, the arrangement of the hot-blast pipes L, the grate E, the ash-pit F, and the end doors leading into the chambers A, B, and C, respectively, lettered M M M, and the doors to the fire-grate and to the ash-pit, lettered in same manner. Fig. 3 repre-

sents a transverse vertical section of the furnace through its center, showing chambers A, B, and C, the position of the boilers K K, and the position of the doors M M in chambers A and C at rear end of the furnace. Fig. 4 represents a horizontal plan and arrangement of the top of the furnace, on a level with the upper side of the boilers, showing the charging holes or openings N N N and the bed-pipes of the hot-blast ovens or compartments, and the flues leading into the said compartments and into the open chimney.

Corresponding letters refer to corresponding parts.

The chambers A, B, and C, have each a specific duty to perform, chamber A being designed and arranged not only to receive the charges of raw ore, and, in a great degree, roast and purify and prepare it for the puddling-chamber, but also to serve as a fire-chamber under the boilers, whereby the waste heat from the puddling-chamber is greatly economized. Chamber B is designed for completing the purification and deoxidation of the ore, begun in chamber A, preparatory to transferring it in regular charges to chamber C. To facilitate the deoxidizing process in chamber B, this chamber is made as nearly air-tight as possible, the doors being made to fit very closely, and not to be opened except when absolutely necessary to introduce or withdraw a charge of ore. Chamber C, as will readily be observed, is the puddling-chamber, wherein the prepared ore is introduced as required for one or more blooms at a time, and where the ore is wrought into lumps or blooms.

The hot-blast pipes, shown in Figs. 2 and 4, are arranged to convey the blast from the bloom to the fire-grate, in any convenient or desirable form, after it leaves the hot-blast or heating-pipes.

In the construction of my furnace up to and including the puddling-chamber C, I do not vary, materially, from the usual plan of constructing such furnaces, except that I so form and construct the roof of the puddling-chamber C that it shall serve as the bottom of the deoxidizing chamber B, as represented, and then, next in turn, I form the roof of chamber B so that it shall serve as the bottom of chamber A, while the boilers and their upper brick-

work settings are to form the roof of this last-named chamber.

The puddling doors in chamber C are not shown in the drawing, they being located on the opposite side from those shown in chambers A and B, the two doors shown in chamber C on the side with the doors in chambers A and B being intended as feeding or charging doors, in order that the puddlers may not be interfered with in their work of puddling.

The advantages of my improved puddling-furnace over the ordinary single bottom, are manifold. It economizes, to the last degree, the entire heating and reducing properties of the fuel used: first, in the puddling-chamber; secondly, in the deoxidizing-chamber; thirdly, in the roasting and purifying-chamber, and in generating steam for power about the premises; and lastly, in heating the blast, which last consideration is, in itself, of the utmost importance, as thereby the work of the puddler is facilitated, and the product of the furnace greatly increased and cheapened.

The furnace being ready for operation and the ore having been properly crushed and cleansed, a sufficient quantity thereof is to be charged into the chamber A through the charging holes or openings N N N in the top of the furnace to make from ten to twenty or more blooms, (according to the size or capacity of the furnace and the quality of the ore used,) and spread out evenly upon the bottom of the chamber without any, or very little, admixture of fine anthracite or other coal. Secondly, the boilers having been properly filled with water, a fire is to be started on the fire-grate E and kept up until the ore charged in chamber A has become partly roasted, when it must be transferred to chamber B with an admixture of a small quantity of fine coal, and

the doors closed as tightly as possible. A new charge is then to be put into chamber A. The two chambers, A and B, being now occupied with ore, the one roasting and purifying, and the other deoxidizing, the ore in chamber B will soon be prepared for the puddling-chamber C, when puddling may be commenced by drawing the proper quantity of ore for one or more lumps or blooms from chamber B into chamber C, and replacing it by drawing into chamber B from chamber A, and charging anew a like quantity of raw ore into chamber A.

During the time of getting the furnace under way—*i. e.*, while roasting and purifying and deoxidizing the first charges before the blast is applied—the flues leading from chamber A into the the hot-blast compartments must be closed, so that the heat will not injure the pipes; or the blast may be passed through the pipes and be discharged into the open air, and thus protect the pipes from injury.

I hereby disclaim all that is covered by the first clause of Jacob Jamison's claim in his patent, No. 88,299, dated March 30, 1869.

Having thus described my invention and improvement, what I claim as new, and desire to secure by Letters Patent, is—

The peculiar construction and arrangement of the air-tight chamber B in connection or combination with the puddling-chamber C, the roasting and purifying-chamber A, the boilers K K, and the hot-blast pipes L, all arranged substantially as and for the purposes set forth.

WILLIAM BUSHNELL.

Witnesses:

THEODORE D. BUSHNELL,
MORTIMER BUSHNELL.