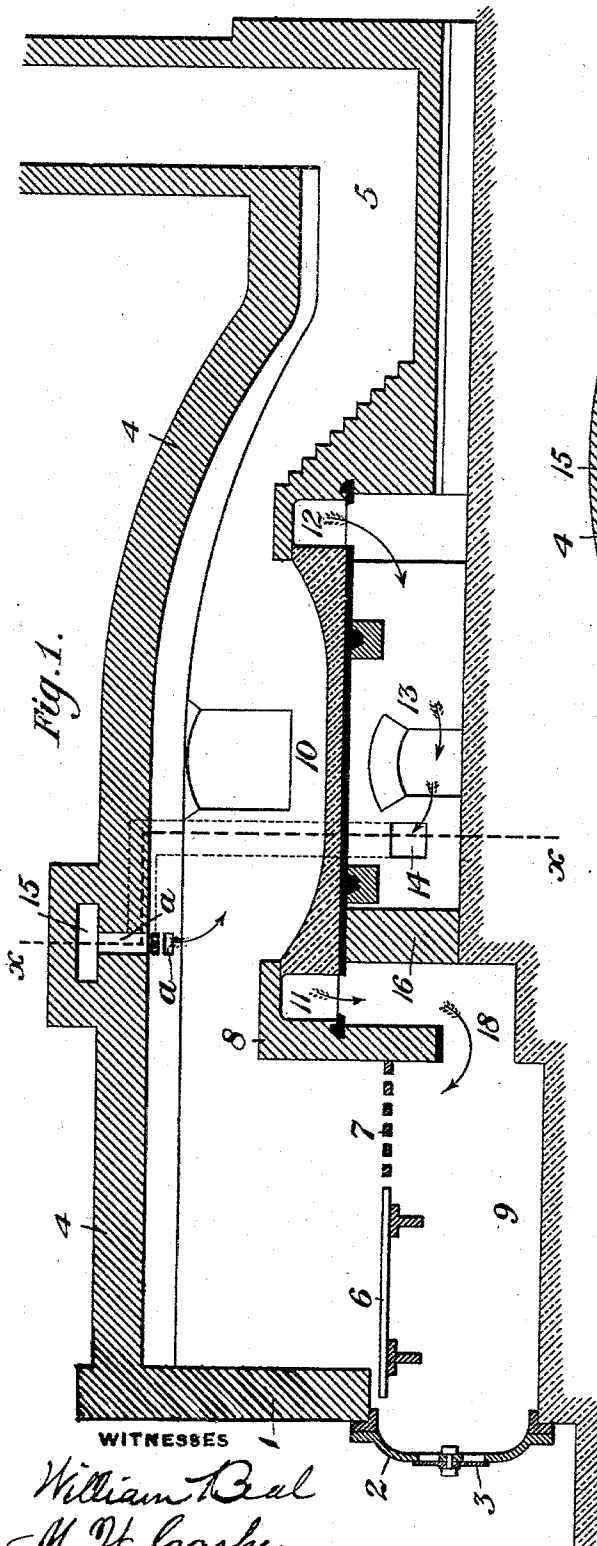


(No Model.)

F. C. ROBERTS.  
PUDDLING FURNACE.

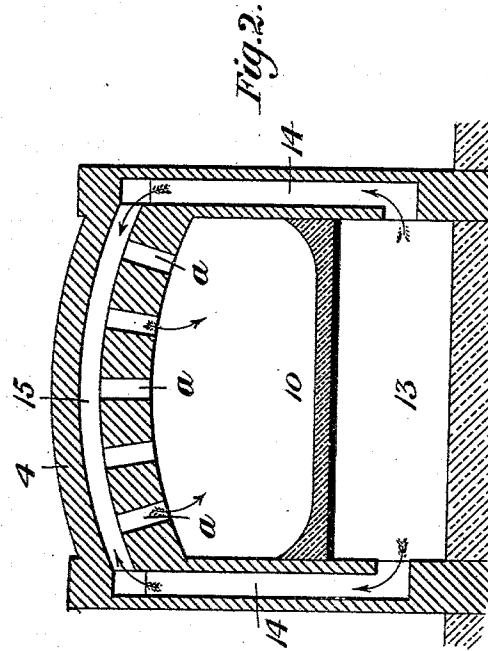
No. 511,162.

Patented Dec. 19, 1893.



**WITNESSES**

William B. Bal  
M. H. Caskey.

**INVENTOR**

Frank C. Roberts,  
by his Attorney  
Wm L. Pierce.

# UNITED STATES PATENT OFFICE.

FRANK C. ROBERTS, OF PHILADELPHIA, PENNSYLVANIA.

## PUDDLING-FURNACE.

SPECIFICATION forming part of Letters Patent No. 511,162, dated December 19, 1893.

Application filed May 25, 1893. Serial No. 475,450. (No model.)

*To all whom it may concern:*

Be it known that I, FRANK C. ROBERTS, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented or discovered new and useful Improvements in Puddling-Furnaces, of which the following is a specification.

In the accompanying drawings which make part of this specification, Figure 1, is a central longitudinal vertical section through a puddling furnace provided with my flues. Fig. 2, is a section on line *x-x*, of Fig. 1.

The purpose of my invention generally stated is to utilize the air heated in the cooling boxes of a furnace by delivering the same under the grate and upon the hearth near the bridge wall, thus effecting a more efficient production of combustible gases in the fire chamber and promoting a more active and thorough combustion of the gases passing into the hearth chamber.

In the accompanying drawings, which make part of this specification, 1 is the front wall of a puddling furnace, having door 2, in which may be placed an air register 3.

4 is the roof of the furnace and 5, the exit to the stack.

6 is a longitudinal and 7 is a cross grate.

8 is the bridge and 9 the ashpit under the grate.

10 is the hearth, having at the front and rear ends cooling boxes 11, 12, extending transversely across the furnace and opening into the outer air at each end. 13 is the usual chamber under the hearth.

14, 14 are flues in the side walls of the furnace, as seen clearly in Fig. 2, communicating at their lower ends with the chamber 13, and at their upper ends with an overhead cross flue 15, which by slots *a-a* communicates with the hearth over or just in advance of the bridge.

16 is a cross wall which divides the ashpit from chamber 13, and 18 is a flue leading from cooling box 11 under the rear grate.

The operation of this puddling furnace is as follows:—The coal is charged into the furnace delivering it upon the front grate 6, a sharp fire being maintained on the rear grate 7; the action of the heat from the fire on the

grate 7, partially distills and gasifies the coal on grate 6, the product of combustion from the fire on grate 7 and the gas from the coal on grate 6 passing over the bridge wall 8 into the hearth chamber 10. By the draft of the stack, air is drawn into the ends of the cooling boxes 11 and 12, where it is heated. The heated air from cooling box 12, passes out of the lower side of said box into chamber 13, under the hearth and thence by side flues 14 to cross overhead flue 15, from which it is delivered by slots *a-a* to the hearth chamber over the bridge wall, or nearly so, where it meets the gaseous products coming from the grates 6 and 7, which burn with an intense and almost smokeless flame. The air has been additionally heated by its passage through the chamber 13 and side flues 14 and 15. The heated air from cooling box 11, passes through flue 18 beneath the rear grate 7, and by its heat materially aids in the production of combustible gases and in securing a high temperature in the hearth chamber 10. The grate may be fed with air either through an air register in the door, or by leaving the door slightly ajar, or the door may be sealed and air delivered into the ashpit under pressure to feed the grate.

It should be noted that as the coal on grate 7 becomes consumed, the surface of the coal on grate 6, which has become partially distilled and coked is moved down on grate 7, thus providing the necessary fuel for the latter and exposing a fresh surface of coal for distillation on the former.

The boxes 11 and 12, are shown in the drawings as straight and rectangular in section, but obviously this is only optional.

It will be seen that by my construction the furnace is cooled by exterior air at the critical points, and the heated air not dissipated but utilized to promote an active and well nigh complete combustion.

It is obvious that the two grates 6 and 7 need not be made with the grate bars of one at right angles to the grate bars of the other as shown in Fig. 1. The grates may be separate and have their grate bars parallel to each other, or one grate only may be provided with a partition dividing the grate into two sections, or one grate only may be provided, the

coal for combustion and the coal for distillation being on the same grate, but each concentrated into two generally separate heaps, and thus practically dividing the grate into two adjacent sections.

I do not limit my invention to the number of flues 14 and 15 shown in the drawings.

Having described my invention, I claim—

1. In a puddling furnace, the combination of a fire chamber, a grate divided into two adjacent sections, a hearth, a cooling box open to the outer air and located at or near the chimney end of said hearth and communicating with a chamber under the hearth; said chamber; flues in the side walls of the furnace connecting said chamber with a cross flue, openings from the same into the furnace, a second cooling box open to the outer air, and located at or near the fire chamber end of the hearth, and a flue connecting the same

with the ashpit chamber, substantially as described.

2. In a puddling furnace, the combination of a hearth, a cooling box located at or near the inner end of said hearth, and communicating with a chamber under the hearth; said chamber; flues in the side walls of the furnace connecting said chamber with a cross flue over the bridge wall; said cross flue; openings from the same into the furnace; a second cooling box located at or near the forward end of the hearth, and a flue connecting the same with the ashpit chamber, substantially as described.

In testimony whereof I have hereunto set my hand this 16th day of May, A. D. 1893.

FRANK C. ROBERTS.

Witnesses:

W. M. SHANNON,  
TRYGOE BAY.