2 Sheets--Sheet 1.

P. W. MACKENZIE.

Improvement in Furnaces for Melting Steel, Heating Boilers, &c.

No. 131,287. Patented Sep. 10, 1872.

Fig: 1.

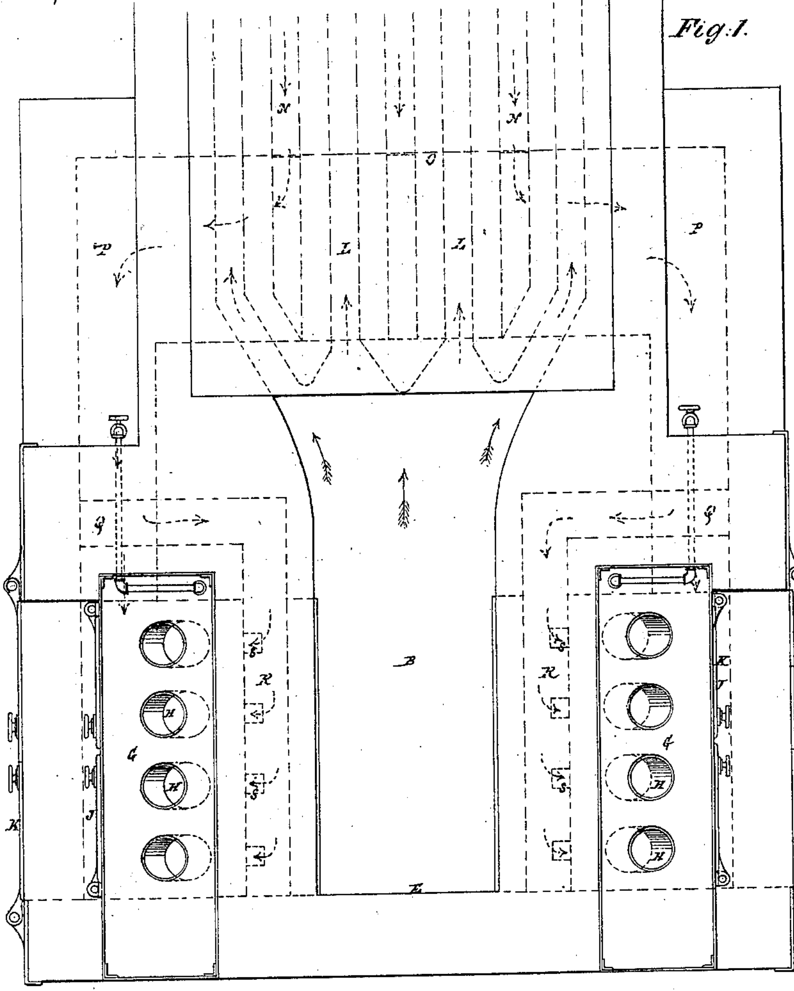
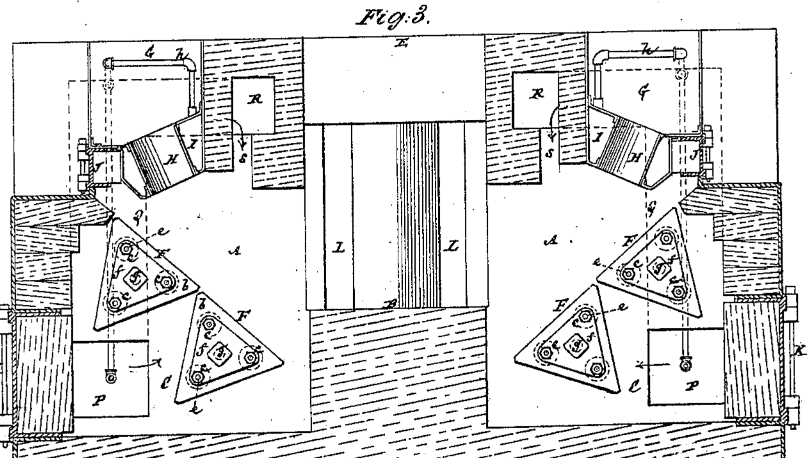


Fig: 3.



Witnesses:

P W Mackenzie

2 Sheets--Sheet 2.

P. W. MACKENZIE.

Improvement in Furnaces for Melting Steel, Heating Boilers, &c.

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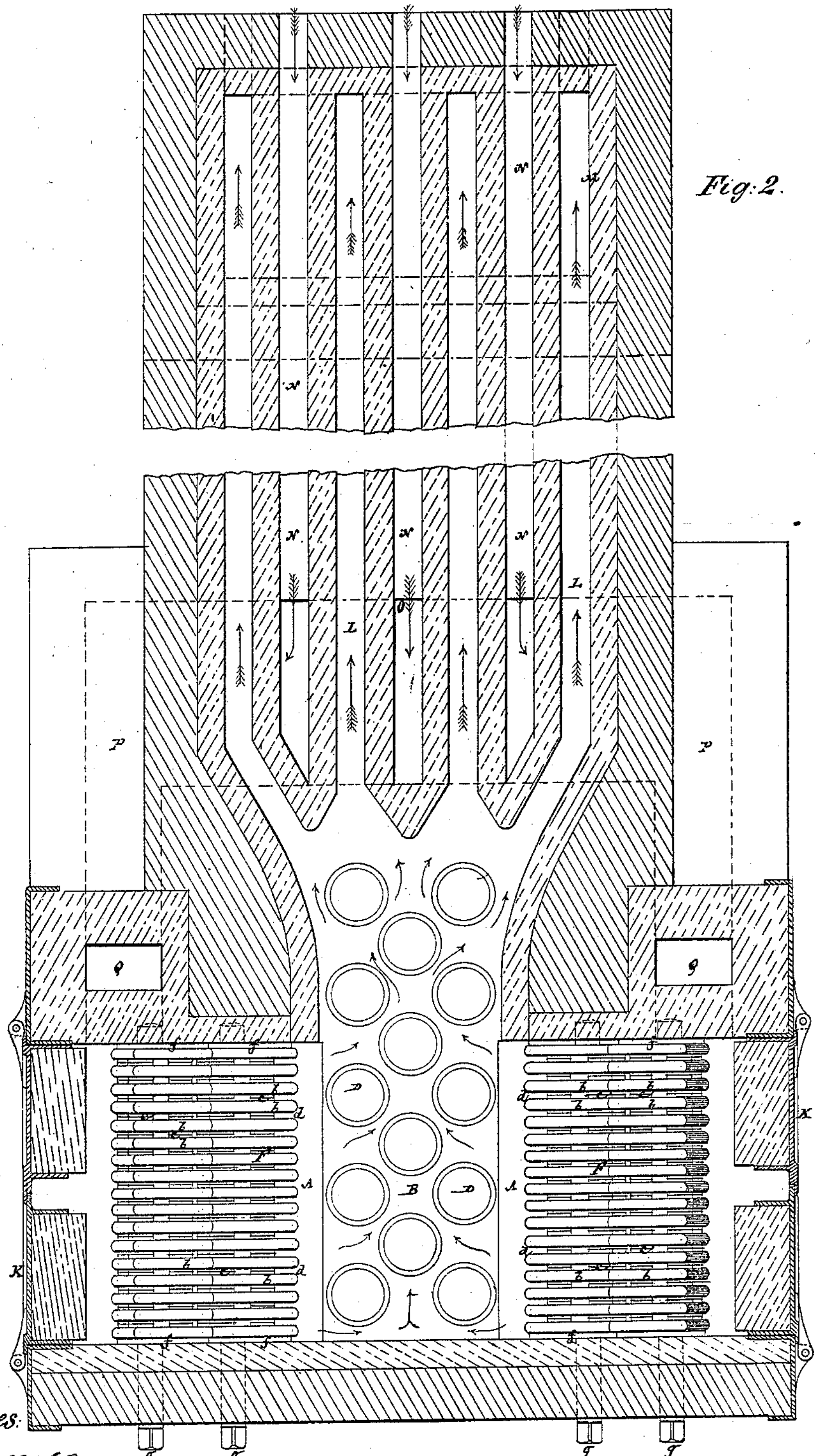

Fig: 2.

Witnesses:
Fred Haynes
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P. W. Mackenzie

UNITED STATES PATENT OFFICE.

PHILIP W. MACKENZIE, OF BLAUVELTVILLE, NEW YORK.

IMPROVEMENT IN FURNACES FOR MELTING STEEL, HEATING BOILERS, &c.

Specification forming part of Letters Patent No. **131,287**, dated September 10, 1872; antedated September 7, 1872.

Specification describing certain Improvements in Furnaces for Melting Steel, and other purposes, invented by PHILIP W. MACKENZIE, of Blauveltville, in the county of Rockland and State of New York.

This invention more particularly relates to furnaces for casting steel and other metals, and will here be described as applied to a furnace for casting steel. Said invention consists, firstly, in a three or more sided reversible grate-bar, constructed of fire-brick, fire-clay, or other like refractory material, for use in connection with a hot blast, the same combining durability with cheapness and efficiency. The invention also consists in a novel arrangement of flues for heating the air by the flues which carry off the gaseous products of combustion, and for conducting it as hot-blast to the furnace, whereby a high degree of heat is obtained for the blast without impairing the draft.

Figure 1 represents a plan of a furnace for casting steel, constructed in accordance with my invention; Fig. 2, a horizontal section of the same through the combustion-chambers; and Fig. 3, a vertical transverse section thereof through said chambers.

A A are the combustion-chambers, and B the melting-floor of the furnace. C C are the ash-pits. D D represent pots in which the steel may be melted, if preferred to melt in pots. E is the opening in the top of the furnace for inserting and removing said pots, the same being closed after the pots are inserted.

The grates, which are shown as inclined, but may be horizontal, are composed of any number of grate-bars—two, F F, to each grate, being here represented. These grate-bars are each constructed of a series of slabs, *b b*, of fire-brick, fire-clay, or other like refractory material, formed with bosses *c c* on them to leave air-spaces *d d* for the draft in between the slabs and to protect the bolts *e e*, which, conjointly with end plates *f f*, clamp or hold the several slabs together. Said slabs are of a shape so that, when arranged and united as shown and described, they form a grate-bar, F, having two or more, preferably three, equal sides, which bar is supported by a central shaft, *g*, that provides for the turning of the grate-bar by means of a crank or wrench applied to the outside end of said shaft for the purpose of changing the sides of the grate under exposure to the fire, as wear renders necessary. In some cases the bolts *e e* and bosses *c c* may be dispensed with and enlarged central bosses, receiving the shaft *g* through them, be substituted. By the construction of said grate-bars of fire-clay, or like refractory material, they are capable of resisting the action of a hot blast without choking, as do water-grates, and without losing any of the heat imparted to them, but confining the same to the combustion-chamber.

The fuel is applied to the grates F F automatically from hoppers or bunkers G G by feed-tubes H H, arranged to pass through water-jackets I I, which latter have steam-pipes *h h* for carrying off the steam as generated in the jackets, and for conducting it to the ash-pits C C to assist the draft. J J are doors for introducing the kindling to light the fires, or for adjusting, if necessary, the fuel on the grates, and K K are the ash-pit doors. The combustion-chambers are constructed mainly for burning bituminous or semi-bituminous coal; but I do not restrict myself to any particular kind of fuel. The gaseous products of combustion from the chambers A A, after performing their duty on the metal in the melting-chamber, or in the pots on the floor B thereof, pass off by a series of horizontal flues, L L, to an uptake, M. These flues are arranged side by side, and their dividing-walls formed with longitudinal air-flues N N, open in the rear, for the admission of air which is heated by radiation from the walls of the smoke-flues, and which passes by a short dip-flue, O, at the forward ends of the flues N N, into side flues P P that open at their ends in the ash-pits to supply the latter with hot blast, and that have vertical flues Q Q connected with them to pass a portion of the heated air or hot blast coming from the rear of the furnace into hot-air distributing-chambers or flues R R arranged immediately over the combustion-chambers. From these hot-air chambers or flues the heated air is passed or distributed by apertures or ducts *s s* over the fire for combustion of the hydrocarbon gases as developed, and to combine with the carbonic oxide produced from the incandescent fuel on the grates. In this way, or by these means, hot blast obtained by

radiation from the escaping gaseous products of combustion is supplied both above and below the grate, thus materially contributing to economy of the fuel, while there is no sensible impairing of the draft by crooked or indirect courses.

What is here claimed, and desired to be secured by Letters Patent, is—

1. A reversible many-sided fire-bar, constructed of fire-clay or other like refractory material, with draft-passages through it, or between the slabs of which it is composed, substantially as specified.

2. The arrangement of the draft-flues L and the air-flues N O P Q R, and distributing apertures *s*, in combination with combustion-chamber A and its ash-pit C, substantially as herein set forth.

P. W. MACKENZIE.

Witnesses:

FRED. HAYNES,

FERD. TUSCH.