Z. S. DURFEE.

Grates for Generating Gas for Fuel.

No. 167,078. Patented Aug. 24, 1875.

Fig. 4

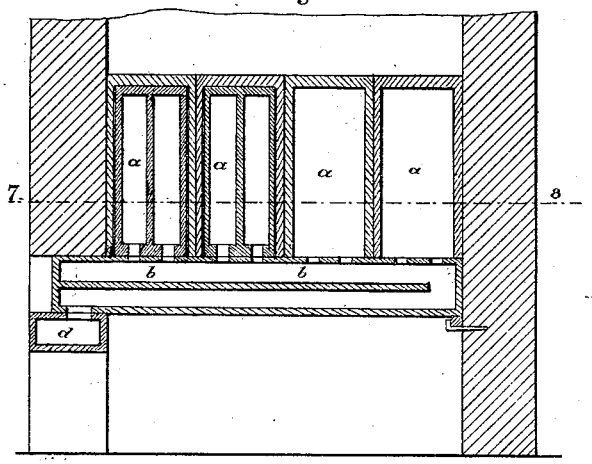


Fig. 1

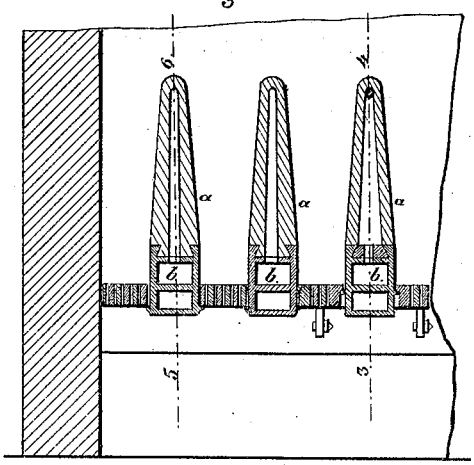


Fig. 5

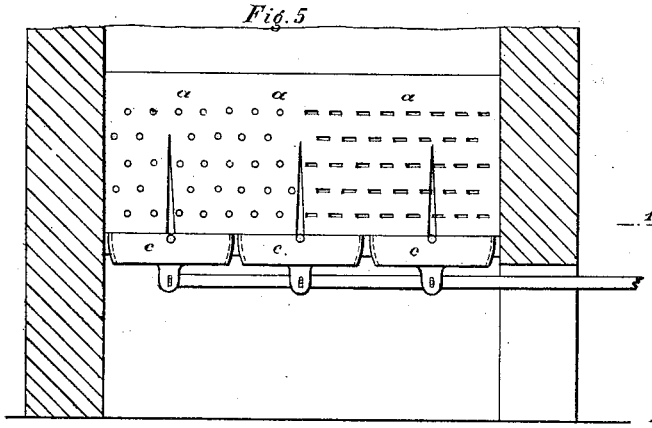


Fig. 2

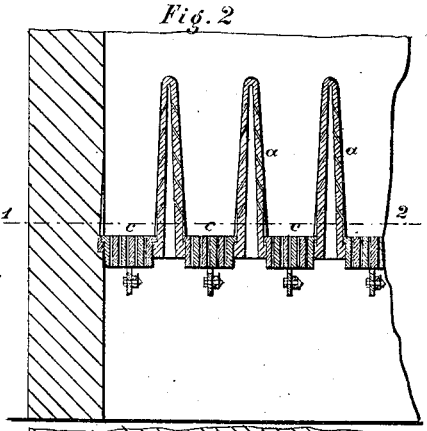


Fig. 6

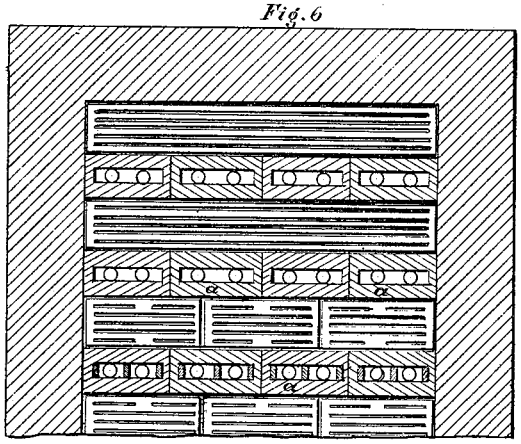
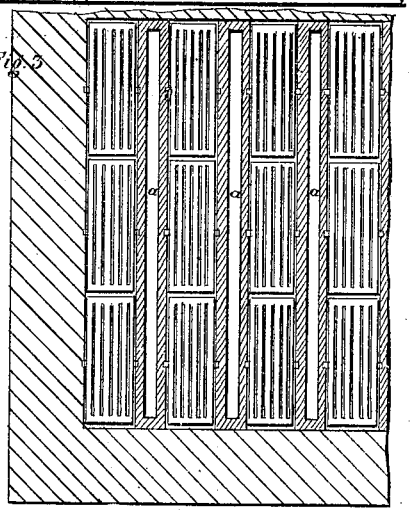


Fig. 3



Witnesses: Chas. H. Ladd, J. B. White

Inventor: Z. S. Durfee

UNITED STATES PATENT OFFICE.

ZOHETH S. DURFEE, OF NEW YORK, N. Y.

IMPROVEMENT IN GRATES FOR GENERATING GAS FOR FUEL.

Specification forming part of Letters Patent No. **167,078**, dated August 24, 1875; application filed February 1, 1875.

To all whom it may concern:

Be it known that I, ZOHETH S. DURFEE, of the city and State of New York, have invented certain Improvements in Generating Gas for Fuel, and in the combustion of fine coal, and in apparatus used therein, of which the following is a specification:

My improvements are specially designed for furnaces which are to burn or distill fuel in a more or less fine and comminuted condition, such as anthracite dust and culm of coals generally; but they may be applied to furnaces for burning any kind of coal, peat, sawdust, &c.; and the improvements relate, chiefly, to the construction of the grates in said furnaces.

Figures 1 and 2 are vertical cross-sections through a furnace with grates on my plan. Fig. 3 is a horizontal section on line 1 2, Fig. 2. Fig. 4 is a longitudinal section, showing two arrangements of the grates in Fig. 1, one being on line 3 4 of Fig. 1, and the other section on line 5 6 of same figure. Fig. 5 is an elevation of the grates of Fig. 2, and Fig. 6 a section on the line 7 8 of Fig. 4.

Instead of, or in combination with, grates of ordinary construction, I make a series of hollow grate-bars, *a a*, which are protruded upward into the fuel to be burned to a considerable height; and these grates I make either of fire-brick or any other suitable fire-resisting material, or of iron, or partly of both. When I make these grates of fire-brick, I sometimes make them without any positive well-defined holes or orifices in their sides, in which case I make them by mixing with the materials out of which they are baked coke or coal-dust, or any suitable combustible material, so that when the bricks are burned the combustible matter will be burned out, leaving the bricks more or less porous and pervious to air. This kind of brick grate I prefer when very fine coal is to be burned. Sometimes I perforate the sides of these brick grates with holes of any convenient size, shape, and number, as shown in Figs. 2 and 5; but these holes should, in most cases, at least, be made to slant downward, as shown in Fig. 2.

The right-hand grate in Fig. 1, and the two left hand in Fig. 4, show brick grates held in position on iron frames. The other grates in the same figures are dovetailed into the air-boxes *b b*. In Fig. 1 these grates are shown in combination both with a common stationary horizontal grate and a tipping grate, the latter being shown in detail in Fig. 5.

The grates in Fig. 2 are made of iron, in one continuous piece, as shown in elevation in Fig. 5, and they support the movable grates *c c*.

The construction shown in Figs. 1 and 4 is intended to facilitate the forcing of the air through the vertical grates at a different pressure from that let or forced in under the ordinary grates combined therewith; and it will also permit the introduction of steam or other vapors or gases, with or without the admixture of air.

In using this last plan the air, vapors, or gases, or mixtures thereof, are brought or forced in by the box *d* into the lower passage of the boxes *b b*, from which they pass into the upper passages of said boxes *b b*, and up through holes in the tops of the boxes into the hollow grates *a a*.

These grates are particularly useful in burning fuel into carbonic-oxide gas, to be subsequently completely consumed by additions of air in the furnaces where high heat is desired.

There is great difficulty in burning some kinds of bituminous coal in gas-producers because of their great tendency to coke and scaffold the fire, and the difficulty increases with any attempt to drive the fires.

It will be seen that by presenting, as I do, a very large increase of grate-surface within a given area, and to a given quantity of fuel, and being able consequently to produce more gas without driving the fire, I can overcome the difficulties of ordinary practice. So, also, with fine anthracite coal. Any attempt to either burn it destructively with any rapidity, or to convert it into a combustible gas, is defeated by the tendency of the coal to burn in holes, which are constantly enlarging and letting the air pass through with no satisfactory combustion, while, with such porous brick grates as I can make, I can, as it were, breathe a large volume of air through the interstices of the finest coal.

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

1. Porous grates for generating gas for fuel,

and for consuming or distilling fine coals and other finely-comminuted fuels, made from fire-brick, or other suitable refractory materials, substantially as described and shown.

2. The combination of vertical porous and perforated grates running parallel to each other through gas-producers and furnaces with ordinary grate-bars, substantially as and for the purposes described and shown.

3. The combination of vertical porous and perforated grates with tipping grate-bars, for the purpose of facilitating the removal of cinders, substantially as and for the purposes described and shown.

4. The combination of vertical porous and perforated grates with air-boxes, designed for heating the air passing through said grates, and also for permitting mixtures of air, steam, or other vapors and gases to pass through said vertical grates while common air is passing through the ordinary grates, substantially as described and shown.

Z. S. DURFEE.

Witnesses:
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