A. C. RAND.

Improvement in Furnace Dead Plates.

No. 125,080. Patented March 26, 1872.

FIG. I.

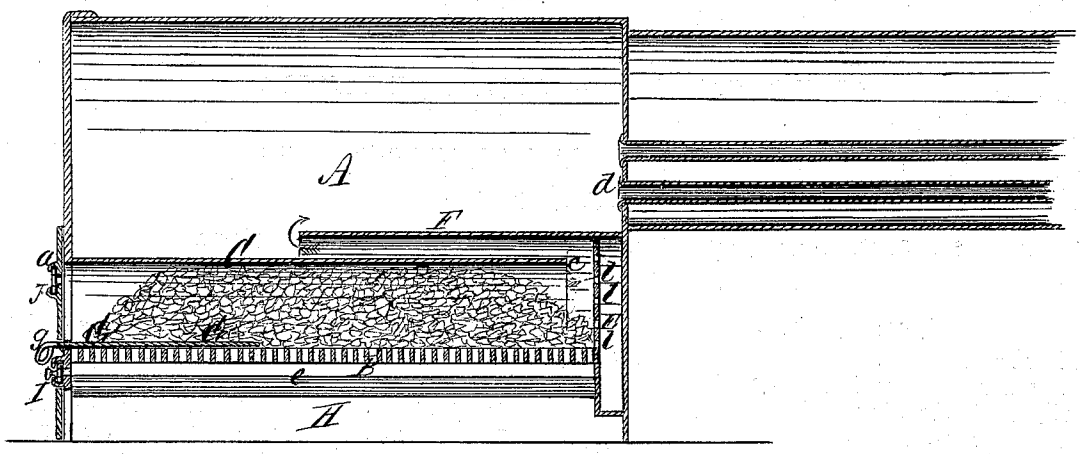


FIG. II.

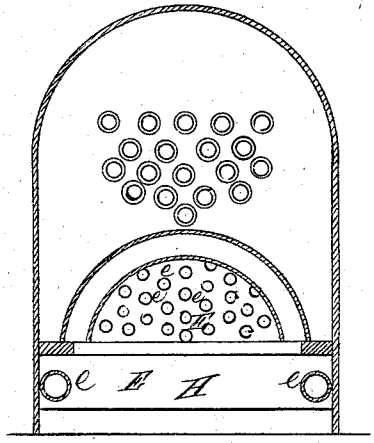


FIG. III.

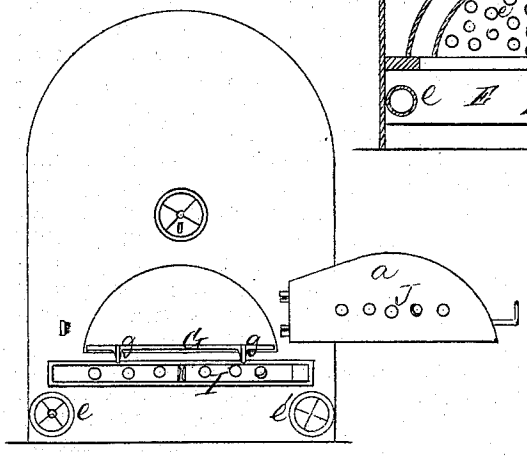
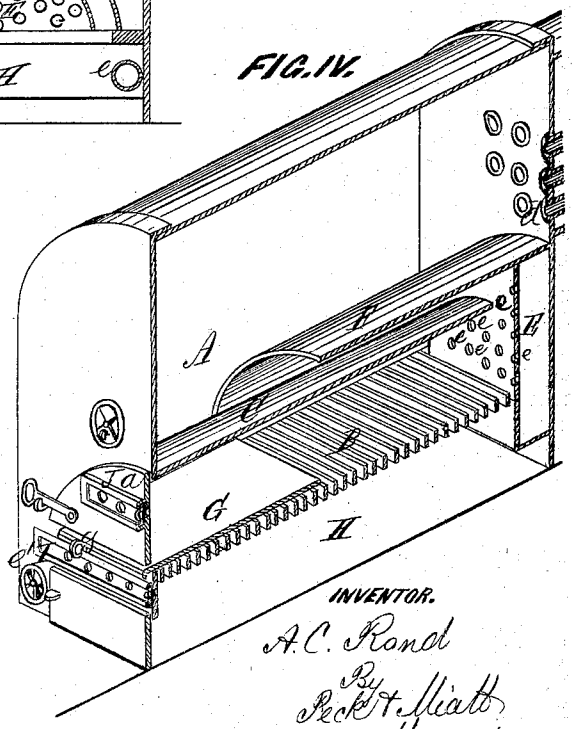


FIG. IV.



WITNESSES.

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UNITED STATES PATENT OFFICE.

ALONZO C. RAND, OF AURORA, ILLINOIS.

IMPROVEMENT IN FURNACE DEAD-PLATES.

Specification forming part of Letters Patent No. 125,080, dated March 26, 1872.

SPECIFICATION.

To all whom it may concern:

Be it known that I, ALONZO C. RAND, of the city of Aurora, in the county of Kane and State of Illinois, have invented a certain new and useful Improvement in Furnaces, of which the following is a specification:

This invention relates to certain improvements in furnaces for the more complete combustion of fuel; and it consists of a plate adapted to be withdrawn from or pushed further toward the back of the furnace. It further consists of a combination of parts, all of which will hereinafter be more fully set forth.

General Description.

In the drawing, Figure 1 is a central vertical longitudinal section of a boiler-furnace having my improvement. Fig. 2 is a vertical cross-section of the same; Fig. 3, a front view of the furnace; Fig. 4, a sectional perspective view.

A is a boiler fire-box or furnace of ordinary construction. Over the grate-bars B is placed an arch, C, preferably made of fire-clay, and like a common gas-retort, except that the bottom is open. This arch fits close against the furnace-door *a*, at the outer end, when said door is closed, and at the inner end stops sufficiently short of the boiler-flue *d* to admit of interposing the air-chamber E at the end of the furnace next said flues, and still allow the necessary amount of space, C, between the arch and air-chamber for the products of combustion to escape. The air-compartment E is supplied with fresh oxygen, by its own separate communication with the outer air, through the tube *e* and damper *e'*. F is a second arch, placed above the first arch or retort C, around which the heated results of combustion pass, in the direction of the arrow shown in Fig. 1, before entering the flues *d*. This arch is also, by preference, made of fire-clay. The front part of the retort C is furnished with a plain instead of a grated bottom surface, which plain surface is formed of a solid piece of metal, G, which can be made to overlap more or less of the grate-surface by being withdrawn from or pushed further toward the back of the furnace by means of the handle *g*. H is the ash-pit of the furnace; I, the main damper; and J, a small damper in the door of the retort. The air-compartment E is supplied with small holes *l l l* on the front, facing the retort C.

The operation of the invention is as follows: Fire is first started on the plate G, and, after becoming well lighted, the burning embers are crowded back onto the grate-surface B. More fuel is continually added until the fire is increased as much as is desired. Till the progress of the fire is as great as may be desired the main damper I is kept fully open, and the small damper J tightly closed, in order that the draught may act as powerfully as possible upward through the fuel. The damper *e'*, which admits air through the tube *e* to the compartment E, is also kept closed until the fire is somewhat advanced, lest the draught through the coal might be somewhat lessened before sufficient heat had been generated to counteract this tendency. When the coal has become ignited, the retort C is kept constantly full by supplying fresh coal through the furnace-door *a*, and at the same operation crowding that which is already partially consumed back as far as possible. Thus the gas and hydrocarbon vapors which arise from the freshly-supplied coal are carried by the draught through that portion which is more highly heated and nearly consumed, the heat to which the gases are subjected becoming greater and greater the further they advance, until in passing through those parts which are fully incandescent the combustible quality becomes entirely transformed. The chamber E, with its separate connection with the outer air, is provided for the purpose of supplying sufficient fresh oxygen to the coal or coke beneath the escape *c*, and to the other gases which have passed through the burning coal, to insure making the combustion complete, and to increase the ordinary heat evolved from burning gases by mingling with them the aforesaid supply of fresh and highly-heated oxygen. The amount of air supplied is regulated by the damper *e'*. The damper J is employed to supply a small quantity of air to the coal, usually to keep up a slight draught through said coal when the main damper I is closed. The position of the second arch F obliges the flame, as it comes from the escape *c*, to pass along the under surface of the arch till it reaches the end nearest the front of the furnace, and then back over the top surface to the boiler-flues *d*. The ob-

ject of this circuit is to more fully insure complete combustion by keeping the mass of flame unbroken as long as possible before it becomes divided on entering and passing through the boiler-flues, and at the same time, by contact with the upper surface of the retort C, assisting in evolving the gas from the coal within said retort. When the combustion of fuel is found to be unnecessarily rapid, or when, for any other reason, it is desired to reduce the fire in front of the retort, the bottom plate G is pushed forward or inward, by means of the handle *g*, so as to cover a larger portion of the grate-surface, and thus shut off the coal above it from ready contact with the air—the damper J being supposed to be closed.

The advantages secured by this invention are important. The principle sought to be applied in the devices shown is that of keeping the gases and vapors thrown off from the fuel subjected to a constantly-increasing degree of heat until the progress of combustion in said gases is perfect, thus allowing no smoke—which is simply a condensation of the vapors and gases occasioned by cooling—to be formed. The invention is especially adapted to burning the different varieties of soft coal because of its provision for avoiding the formation of smoke. As is universally known, the great objection to using the softer grades of coal is the dense smoke which is emitted in burning it with all ordinary fixtures, occasioning both loss of fuel and many discomforts. These evils are entirely avoided by the use of the apparatus described. The invention can readily be applied to the boiler-furnaces in common use, and its application to any of the ordinary forms of furnaces is both simple and cheap.

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

1. The plate G, in combination with the retort C, for the purpose specified.

2. The combination of the retort C, bottom-plate G, air-chamber D, arch F, with or without the compartment E, arranged substantially as described.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

ALONZO C. RAND.

Witnesses:
C. C. PECK,
GEO. W. MIATT.