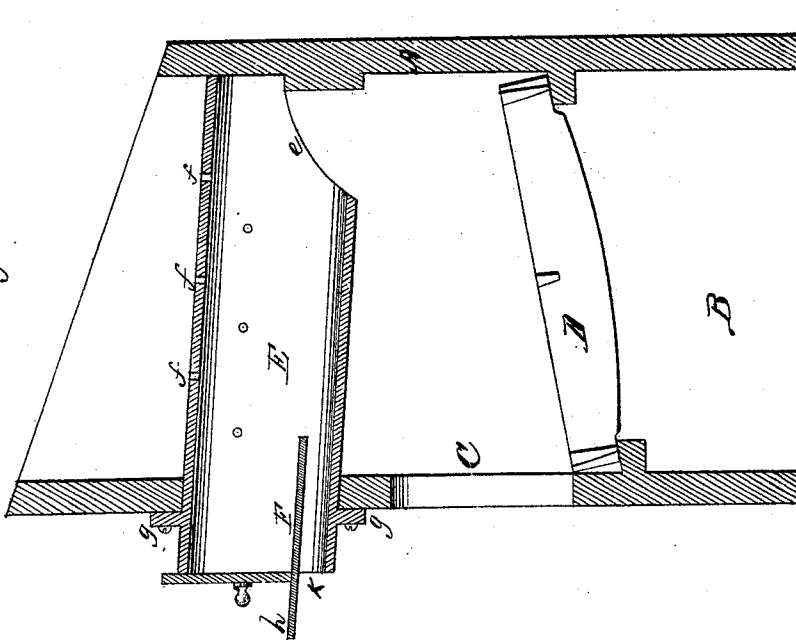


**J. B. ROOT.**  
**Boiler-Furnaces.**

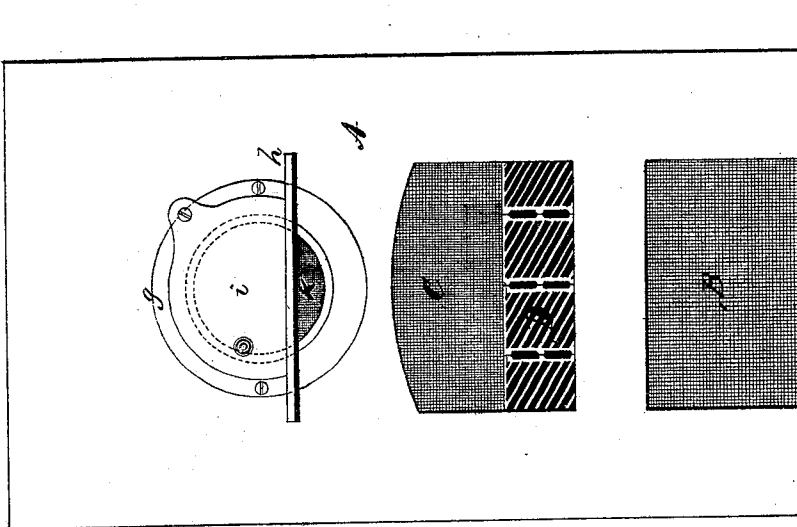
No. 141,594.

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*Fig 2.*



*Fig 1.*



Attest:  
*Rowland Rothwell*  
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Inventor:  
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*By J. M. Plympton,*  
*Atty*

# UNITED STATES PATENT OFFICE.

JOHN B. ROOT, OF NEW YORK, N. Y.

## IMPROVEMENT IN BOILER-FURNACES.

Specification forming part of Letters Patent No. **141,594**, dated August 5, 1873; application filed January 15, 1873.

*To all whom it may concern:*

Be it known that I, JOHN B. ROOT, of the city, county, and State of New York, have invented a new and useful Improvement in Boiler-Furnaces; and that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings and to the letters of reference marked thereon, making a part of this specification.

This invention is in the nature of an improvement in burning bituminous coal for steam and other purposes; and the invention consists in placing within and over the grate-bars of the furnace of a boiler or other kind of furnace one or more receptacles or retorts, within which is placed the bituminous coal that it is desired to burn for the purpose of generating steam. The heat from the furnace, impinging against the receptacle, drives out of the coal placed therein the carbonaceous and other inflammable gases, which escape through apertures made in the top of the receptacle or retort, and, igniting immediately upon their escape, burn beneath the boiler or other structure with a steady, pure, and intense flame, no part of the unconsumed carbon being allowed to escape. The coke that remains within the receptacle or retort is allowed to fall upon the grate-bars where it is consumed, to generate the necessary heat for driving out the inflammable gases, the charge within the receptacle or retort being renewed from time to time as the coal within it becomes coked or freed from its gases.

In the accompanying sheet of drawings, Figure 1 represents an end elevation of my apparatus and furnace; and Fig. 2, a longitudinal section of same.

Similar letters of reference indicate like parts in the several figures.

A represents the walls of the furnace or fire-box, provided with the ordinary ash-pit B, furnace-mouth C, and grate-bars D. Into the fire-box or furnace, and at any desirable height above the grate-bars, are placed one or more receptacles or retorts, E. This receptacle or retort may be made of any desirable material, such as cast, wrought iron, or fire-clay, or of iron lined with fire-brick or fire-clay, and it may be made in one entire piece, or be composed of rings or sections secured together in

any desired way, and it may be cylindrical or polygonal. The receptacle or retort being constructed in any of the ways above mentioned, it is inserted into the furnace either horizontally or at an angle. The inner end of the retort may rest upon the bridge-wall of the furnace or upon a shelf constructed within the furnace for the purpose of supporting it, or it may be of a length not sufficient to reach the rear side of the furnace, and be supported from below or above. This receptacle or retort is hollow and open at both ends, and may have a portion of its rear under surface cut away, as shown at *e*, Fig. 2, and its upper surface is perforated with a series of holes, *f*. When the receptacle or retort is in place its front end projects beyond the face of the fire-box or furnace, as shown in Fig. 2, to which it may be secured by a collar, *g*, or in any other desirable way. Within the outer end or mouth of the retort is fitted a plate, F, which extends a short distance within the retort and projects outward with a flare, *h*, and pivoted to the mouth of the retort is a gate, *i*.

My apparatus being constructed substantially as above described, its operation is as follows: A charge of bituminous coal is placed within the retort through the mouth or outer end of the same, when it may be closed by the gate *i*, or by banking up fine bituminous clay or slack. The flames and heat from a fire burning on the grate-bars D ascend, and, impinging on the under surface of the retort, drive out through the apertures *f* in the upper surface of the same the carbonaceous and other gases, which at once ignite, and, combining with the air passing up between the grate-bars and through the mouth of the retort, it burns under the boiler or other structure with a steady and clear flame, without smoke, producing an intense heat. As soon as the coal within the retort becomes coked or deprived of its inflammable gases a poker or other instrument is inserted in the aperture *k* under the plate F and the coke pushed to the rear end of the retort, whence it falls through the cut-off portion *e*, if the retort extends to the bridge-wall, as shown in Fig. 2, or it is pushed beyond the inner end of the retort, if it does not extend quite to the bridge-wall; thus allowing the coke to drop on the fire on the grate-

bars, where it is burned as fuel to drive off the inflammable gases of a fresh charge of bituminous coal, no other fuel being required for this purpose, and so on, from time to time, as long as it is desired to generate heat for the purpose of making steam or any other purpose.

From the foregoing description it will be seen that bituminous coal burned as above described must result in a very great saving, for, as is obvious, every combustible part of the coal is consumed, none being allowed to escape in the shape of unconsumed carbon or smoke, so that not only is a great saving effected in the consumption of the coal, but other serious disadvantages arising from large volumes of smoke are entirely obviated.

The grate-bars D of the furnace may be inclined, as shown in Figs. 1 and 2, so that the coke, as it falls from the retort E, will gravitate toward the lower ends of the grate-bars, and any suitable provision may be made at the lowest end of the grate-bars for removing the slag and other refuse.

Having thus described my invention, what I

claim as new, and desire to secure by Letters Patent, is—

1. A boiler or other furnace, provided with retorts having internal outlets for the gas and coke, for containing bituminous coal, from which gases are freed and ignited to increase the heat in the furnace, and the coke from which is consumed in said furnace, as herein described.

2. A perforated retort having both ends open, in which bituminous coal is burned, as described, in combination with a boiler or other furnace, as and for the purpose set forth.

3. A retort constructed with a portion of its under side cut away, and with perforations and gate and plate, in the manner and for the purpose described.

4. The combination of the hereinbefore-described retort, with a furnace provided with inclined grate-bars, as and for the purpose described.

JOHN B. ROOT.

Witnesses:

CHARLES H. SMITH, Jr.,  
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