

L. F. BECKWITH.
Grate and Fire Chamber.
No. 220,909. Patented Oct. 28, 1879.

Fig. 1.

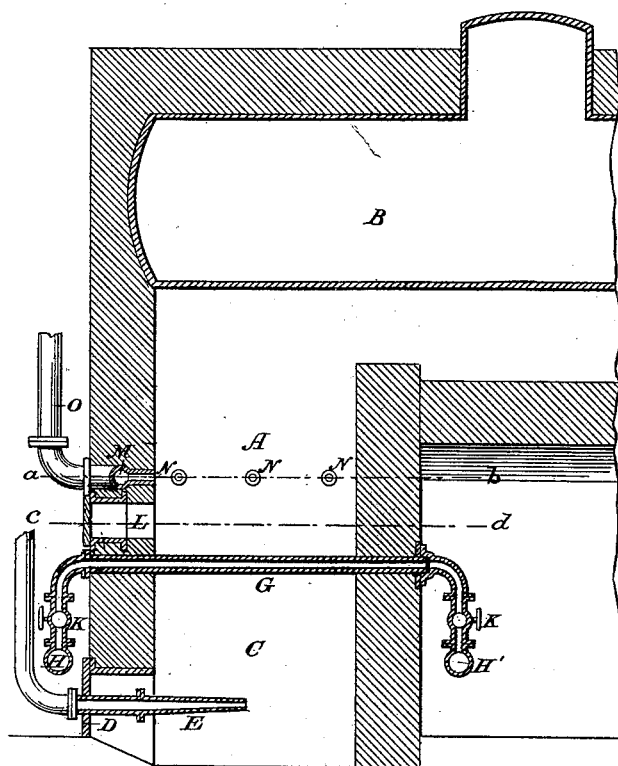


Fig. 2.

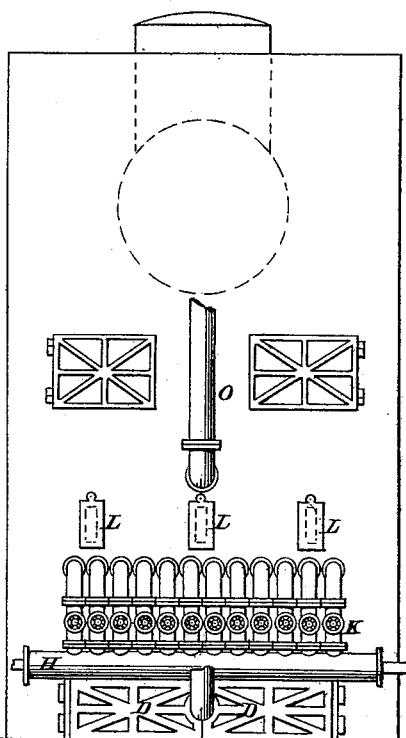


Fig. 3.

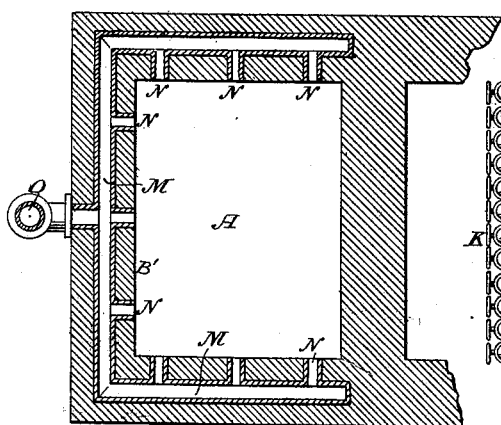
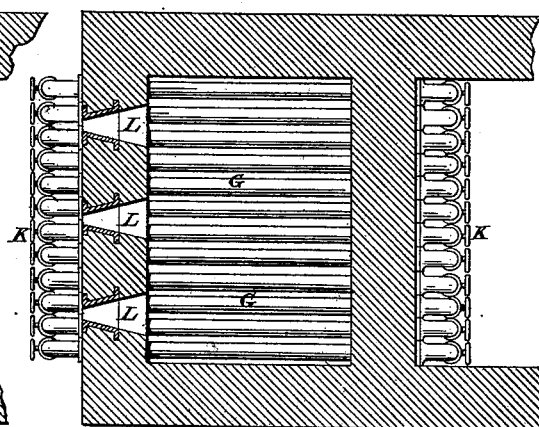


Fig. 4.



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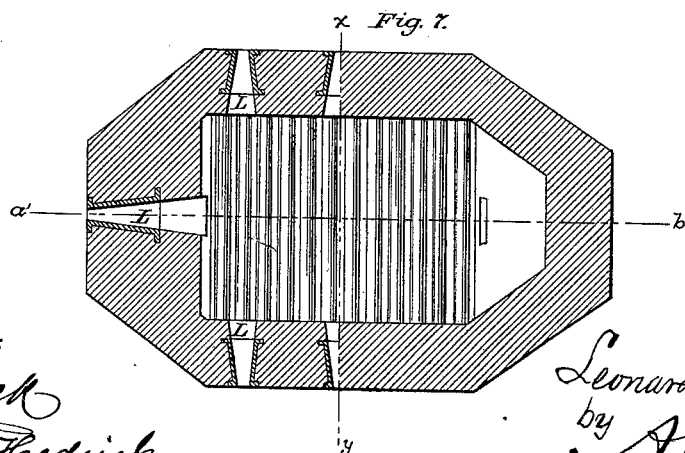
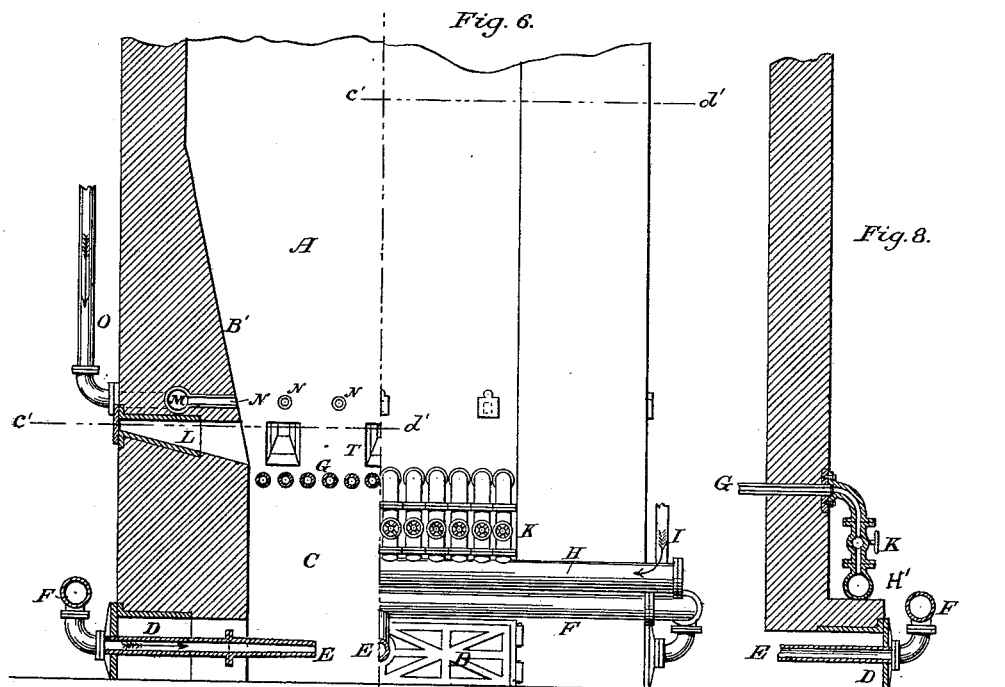
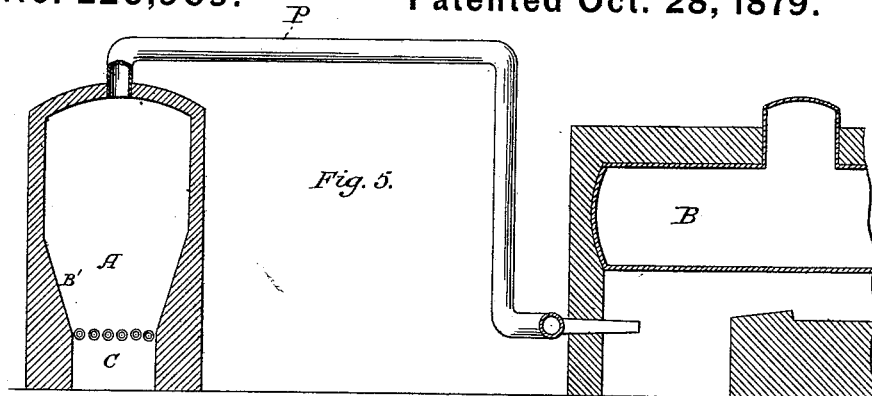
Inventor:

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2 Sheets—Sheet 2.

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UNITED STATES PATENT OFFICE.

LEONARD F. BECKWITH, OF NEW YORK, N. Y.

IMPROVEMENT IN GRATES AND FIRE-CHAMBERS.

Specification forming part of Letters Patent No. **220,909**, dated October 28, 1879; application filed August 7, 1879.

To all whom it may concern:

Be it known that I, LEONARD F. BECKWITH, of New York city, in the State of New York, have invented a new and useful Improvement in Grates and Fire-Chambers of Furnaces for Generating Steam and for other purposes, which invention is fully set forth in the following specification.

This invention relates more particularly to furnaces in which the fuel is burned by means of a blast introduced under the grate into a closed ash-pit. In this class, and, indeed, in all furnaces in which a very high temperature is maintained, much difficulty has been encountered in obtaining a grate capable of resisting the heat and clinkers and the working of the fuel with the bars. Grates of cast or wrought iron bars have all been tried and failed. Hollow iron grate-bars, through which a circulation of water is maintained, although serving a good purpose, are found, as at present made, to be in many cases very imperfect. The fuel clinkers upon the bars, and, in spite of the water, the metal is injured in spots; and such grates being constructed, so far as I am aware, with the bars connected, or more or less dependent upon each other, it is impossible to remove and replace a bar which has been injured without stopping the furnace and entailing much loss at every such operation.

A grate of separate special fire-bricks has been found to last comparatively well; but the bricks become broken by the stirring-bars, and, being spaced about two inches apart, much coal is lost with the ashes.

In this invention the defects above mentioned are obviated.

The invention consists in a grate with a series of independent and disconnected hollow iron bars, with an interior circulation of water, which bars are each removable without disturbing the others, the supply of water to any one or more being cut off, as required. The bars are spaced to suit the fuel used.

A series of work-holes are placed above the grate, and with splayed or flaring sides, so that the bars for stirring the fuel and breaking up the ashes and half-fusible clinkers may be able to reach all points of the grate.

Above the work-holes are small openings

communicating with the interior of the furnace, through which superheated steam or steam and air are introduced for generating gaseous fuel by decomposition and moderating the intensity of the fire.

The combination, with the fire-grate, of the means for the introduction of superheated steam, or steam and air, and the work-holes located between the grate and the point of introduction, constitute a second part of this invention.

By the aid of the work-holes not only is the grate protected, but the fuel is kept in proper condition for action of the air which passes through the bars, so that when superheated steam is introduced the conditions most suitable for its decomposition are obtained.

The following description will enable those skilled in the art to which it appertains to make and use my invention, reference being had to the accompanying drawings, which form a part of this specification.

Figure 1 represents, in longitudinal section, a furnace constructed in accordance with my invention applied to a steam-boiler; Fig. 2, a front view of the same; Fig. 3, a view in section on line *a b*, Fig. 1; and Fig. 4, a view in section on line *c d*, same figure. In Fig. 5 the furnace is shown detached from the boiler, and is used to generate gaseous fuel, which is introduced beneath the boiler, as shown. Fig. 6 is an enlarged view, in section and elevation, of the lower part of an apparatus similar to that represented in Fig. 5; Fig. 7, a horizontal section on lines *c' d'*, Fig. 6; and Fig. 8, a sectional detail view on line *x y*, Fig. 7. In Fig. 6 the sectional part is taken on line *a' b'*, Fig. 7.

The same letters refer to like parts on all the figures.

A represents the walls of the furnace, made of masonry, as usual, or in any suitable way; B, Figs. 1 and 5, a steam generator or boiler; C, the ash-pit, which is closed by suitable doors D; E, short pipes or nozzles for delivering a forced blast of air from the distributing-pipe F, with which they are connected; G, the hollow grate-bars, each connected at opposite ends with the water-pipes H H' by curved pieces provided with cocks K; I, a pipe

for introducing the water into pipe H; M, a distributor or passage in the walls of the furnace, connected with the interior of the fire-chamber by the openings N; O, a pipe for introducing superheated steam or steam and air into the distributor or passage M; P, Fig. 5, a pipe for conveying the gaseous fuel from the generator to the boiler, and B', Figs. 5 and 6, the slanting sides of the furnace-walls, called "boshes," which facilitate the burning of certain kinds of inferior fuel with a large portion of ashes.

The bars G are preferably made of solid wrought-iron bored out, although in some cases cast-iron may be found to answer. These bars are attached to the curved pipes by means of a collar at one end, and at the other by any ordinary or suitable coupling, which will permit the withdrawal of the tubes through the walls of the furnace, as shown in Figs. 1 and 8. At each end stop-cocks are provided, two for each bar, so that the supply to any bar may be cut off, the bar removed and repaired or replaced by a new one, and the circulation established therethrough without stopping the furnace or drawing the fire.

The work-holes L are splayed or enlarged on the inside, so as to command all parts of the grate. The bottom is preferably inclined downward, (see Fig. 6,) the better to break up clinkers and ashes. The form of these holes is clearly shown in Figs. 1, 4, 6, and 7. In Figs. 6 and 7, the furnace being detached, the work-holes are placed all around, which is the preferable construction.

The fuel in all parts of the zone between the pipes N and the grate may thus be worked and the grate kept clear. Each work-hole is provided with a small door and iron cover.

The operation will be readily understood in connection with the foregoing description. Fire having been started and an air-blast established through the nozzles E, water is introduced through the pipe I from a reservoir by a suitable pump, or from an elevated source of supply, into the distributor H, whence it passes through the bars G into the pipe H', and is returned to the reservoir to cool, or allowed to escape, according to circumstances. Superheated steam, furnished from any suitable source, alone or mixed with air, is forced, through the pipe O and distributor M and openings N, into the burning and incandescent fuel on the grate-bars. Bars are introduced, as required, through the work-holes L to stir the fuel beneath the point of entrance of the steam, to break up clinkers and clear the grate.

In Figs. 1 and 2 the combustible gases escaping from the fuel are burned at the top of the fuel; or, if desired, they may be carried off for use under other boilers or for other purposes. If desired, air alone might be introduced through the pipe O, and the quantity

of fuel regulated so that comparatively little combustible gas or gaseous fuel will be produced.

In Fig. 5 I have shown the furnace adapted to produce a large quantity of gaseous fuel, which is carried, by the pipe P, beneath the boiler and there burned.

By one apparatus of this kind, as shown, also, in Figs. 6, 7, and 8, a number of boilers may be supplied; or the gaseous fuel generated could be stored or used, as desired, for cooking, illuminating, general heating, and metallurgical purposes.

The character of the gases from the furnace will depend upon the depth and temperature of the fuel in the fire-chamber and the amount of the air and steam admitted, which latter is regulated by stop-cocks in the inlet-pipes, or by any suitable means.

Modifications might be introduced into the grate, if desired. For example, the water might be made to return through the same or through separate pipes; or two, and, perhaps, three, pipes might be connected with each other, so as to be removed and replaced together without interfering with the others; but the construction shown is preferred.

Having thus fully described my said invention, and the manner in which the same is or may be carried into effect, what I claim, and desire to secure by Letters Patent, is—

1. A fire-grate composed of independent hollow iron bars, connected by separate couplings and cocks with distributing and collecting pipes, for causing a circulation of water therethrough, each of said pipes being capable of removal without interfering with the others or with the operation of the furnace, substantially as described.

2. The combination, with the walls of a furnace, of a series of hollow bars, forming a fire-grate and extending through the furnace-walls, and water distributing and collecting pipes connected with said bars outside the said walls, the connection with one or both said pipes being curved, and the bars being adapted for removal independently of one another, substantially as described.

3. The combination of a fire-grate, a distributor or passage in the walls of the furnace, and connected with the interior thereof, by numerous openings, and a series of work-holes arranged above the grate, between it and the openings into the said distributor or passage, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

LEONARD F. BECKWITH.

Witnesses:

JAMES C. ROSSI,
E. GILLET.