(No Model.) 2 Sheets—Sheet 1.

E. HERRMANN & L. P. COHEN.

FURNACE.

No. 458,712. Patented Sept. 1, 1891.

Fig. 1.

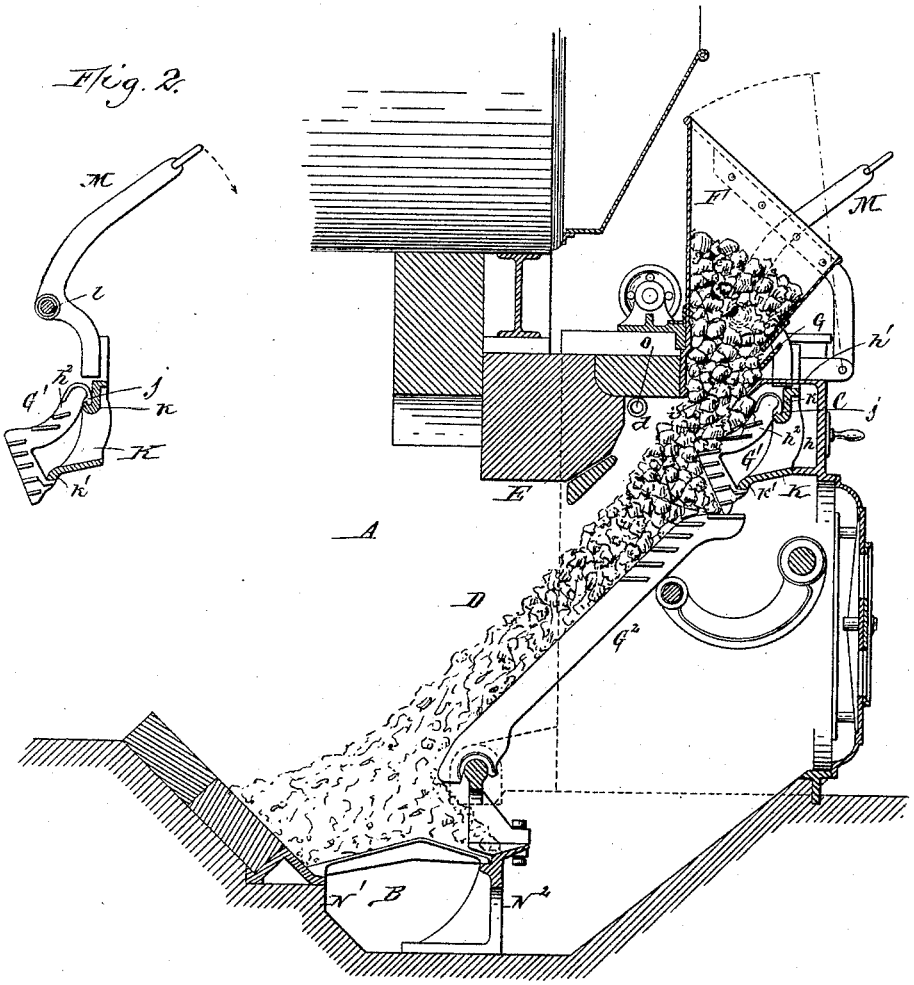

Fig. 2.

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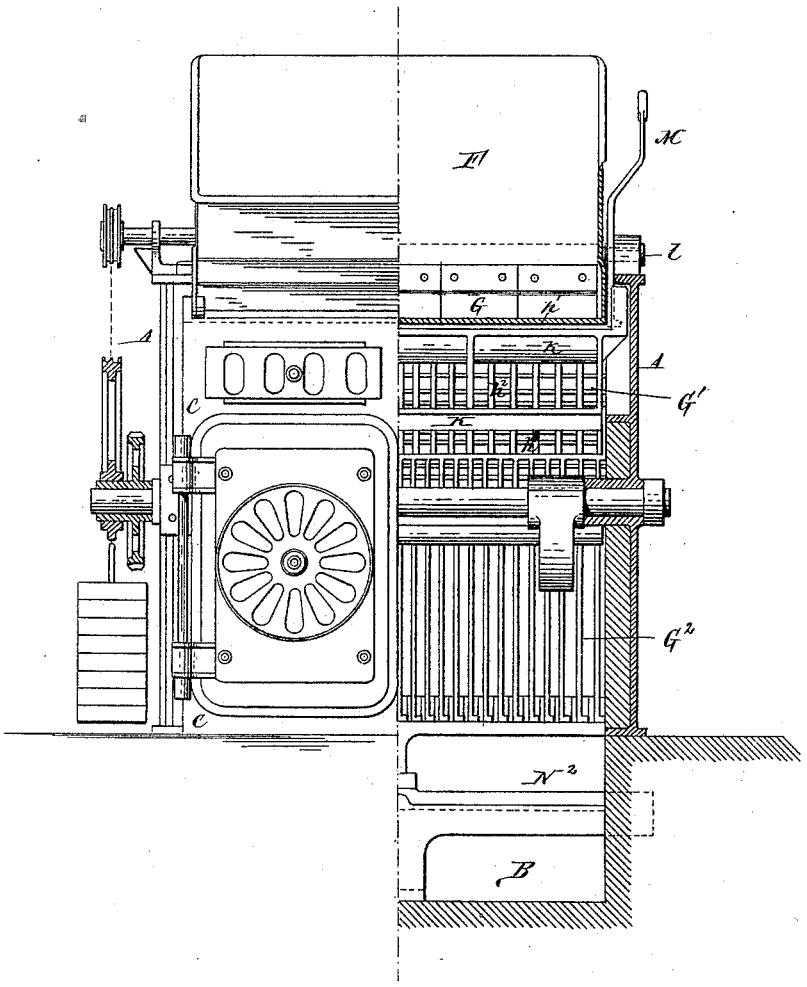
Fig. 3.



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UNITED STATES PATENT OFFICE.

ERNEST HERRMANN AND LOUIS PHILIPPE COHEN, OF PARIS, FRANCE.

FURNACE.

SPECIFICATION forming part of Letters Patent No. 458,712, dated September 1, 1891.

Application filed August 2, 1890. Serial No. 360,792. (No model.)

To all whom it may concern:

Be it known that we, ERNEST HERMANN and LOUIS PHILIPPE COHEN, citizens of the Republic of France, residing at Paris, France, have invented new and useful Improvements in Furnaces, of which the following is a specification.

Our invention relates to steam-boiler furnaces in which an inclined grate having movable sections is employed. A furnace of this kind is described and shown in Letters Patent of the United States No. 385,623, granted to us July 3, 1888.

The object of our present invention is to so construct the grate that the fresh undistilled fuel may be fed underneath the distilled live burning fuel, thereby effecting a more complete combustion of the liberated gases and avoiding the production of smoke.

In the accompanying drawings, consisting of two sheets, Figure 1 is a longitudinal sectional elevation of a steam-boiler furnace provided with our improvements. Fig. 2 is a detached view of the upper movable grate and its supporting-frame. Fig. 3 is a front view of the furnace, showing one half thereof in elevation and the other half in section.

Like letters of reference refer to like parts in the several figures.

A represents the side walls of the furnace; B, the ash-pit; C, the front wall of the furnace; D, the fire or combustion chamber, and E the arch forming part of the roof of the fire-chamber.

F represents the fuel hopper or receptacle arranged above the upper end of the inclined grate and supplying the fuel thereto. The inclined grate extends from the fuel-hopper nearly to the bottom of the ash-pit and is composed of three sections G G′ G^2. The upper section G forms the lower front wall of the fuel-hopper and consists of several grate-bars, which are secured at their ends to the forwardly-projecting side walls of the hopper. The intermediate grate-section G′ is arranged in a chamber *h*, formed in the furnace-front C below the upper grate-section G and separated therefrom by a horizontal plate *h*′. This intermediate grate-section is composed of angular grate-bars h^2, each having its upper portion inclining inwardly and its lower portion outwardly, the two portions standing about at right angles to each other, so that these grate-bars form an angular grate-section which has its salient angle projecting into the throat *i*, formed between the arch E and the inclined grate opposite a recess or depression *d*, formed in the adjacent side of the arch E. The pitch of the upper portion of the angular grate is made so small that it will support the superincumbent body of fuel and prevent the latter from rolling or sliding down. The lower portion of the angular grate is preferably inclined outwardly to form a recess, which retains a sufficient quantity of the burning fuel to prevent the fire from becoming extinguished near the angular grate upon feeding fresh fuel. These angular grate-bars are provided at their upper ends with hooks *j*, whereby they are hung upon the upper ledge or cross-bar *k* of a depending supporting-frame K, the lower ends of the bars resting against the lower ledge *k*′ of said frame. This supporting-frame is mounted upon a horizontal rock-shaft *l*, which is journaled in bearings in the side walls of the furnace.

M represents a hand-lever secured to one end of the rock-shaft *l*, and whereby the latter is turned or oscillated to move the angular grate-section G′.

The lower grate-section G^2 is composed of a series of grate-bars, which are preferably pivoted at their lower ends, as shown in the drawings and in the Letters Patent hereinbefore referred to, so that their upper ends may be swung inwardly or outwardly.

N is a slag-grate arranged below the foot of the grate-section G^2 and supported at its rear end upon an inclined abutment N′ and at its front end upon a transverse frame N^2.

o represents the air-pipe terminating in the throat *i*, and whereby the air is supplied to the gases generated in the fire-chamber.

When the fire has been started in the furnace, the hopper is charged with fuel, which latter is caused to descend successively over the grate-sections by shaking the movable grates. The fuel on the surface of the layer burns brightly, while the covered fuel adjacent to the grate is being distilled. In its natural slope the fuel does not enter or fill the recess *d* of the arch and does not descend except when the movable grate-sections are

moved or shaken. When it is desired to feed the fire, the angular grate-section G′ is swung inwardly across the throat *i* into the position shown in dotted lines in Fig. 1. This causes the fuel resting on the angular grate to be moved bodily toward the recess of the arch, and the surface of the layer, consisting of distilled fuel, to be pushed into the recess, the grate forming a cavity or pocket in the bottom of the layer corresponding to the shape of the grate. Upon allowing the grate to fall back into its normal position by gravity the fuel pushed forwardly remains in this position and the unsupported fuel above drops into and fills the cavity or pocket so formed. The distilled fuel which has been pushed into the recesses *d* beyond the angle of repose rolls over the surface of the inclined layer and is consumed upon the lower grate-section. By feeding the fresh undistilled fuel behind the live burning fuel the gas liberated from the covered fuel is consumed as it passes through the burning fuel and becomes mixed with air, thereby preventing the escape of unconsumed volumes of gas and rendering the combustion smokeless.

We claim as our invention—

1. The combination, with the fire arch or wall, of a lower inclined grate, a fuel-hopper, and a removable grate-section arranged above the inclined grate and below the fuel-hopper and constructed with an angular face which projects toward the fire-arch, whereby the distilled fuel opposite the movable grate-section can be pushed forward to roll over the burning fuel on the lower grate and the fresh superincumbent fuel is caused to drop behind the displaced fuel, substantially as set forth.

2. The combination, with the fire arch or wall, of an inclined grate forming a throat or passage with said arch and having an angular section which is movable across said throat, and which has its upper portion inclined inwardly and its lower portion inclined outwardly, substantially as set forth.

3. The combination, with the fire arch or wall having a recess or cavity, of an inclined grate forming a throat or passage with said arch and having an angular section which is movable across said throat and arranged with its apex opposite the recess of the arch, substantially as set forth.

4. The combination, with the fire arch or wall, of an inclined grate forming a throat or passage with said arch and having a section which is movable across said throat and composed of grate-bars, the upper portions of which are arranged at an angle to the lower portions thereof, substantially as set forth.

Witness our hands this 16th day of July, 1890.

ERNEST HERRMANN.
LOUIS PHILIPPE COHEN.

Witnesses:
J. L. RATHBONE,
CHARLES DION.