(No Model.)

# C. RUSSMANN.

## FURNACE.

No. 269,720. Patented Dec. 26, 1882.

Fig. 2.

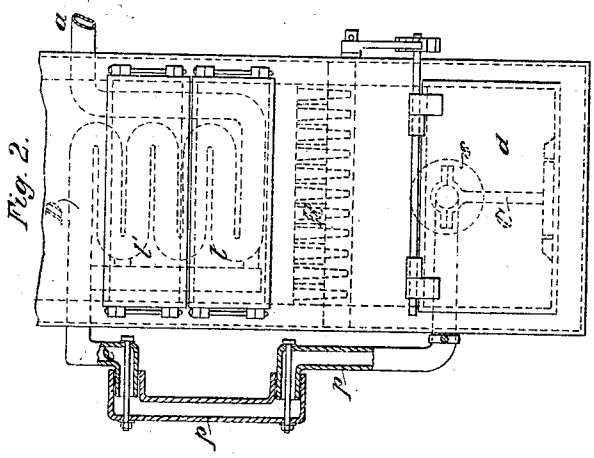


Fig. 1.

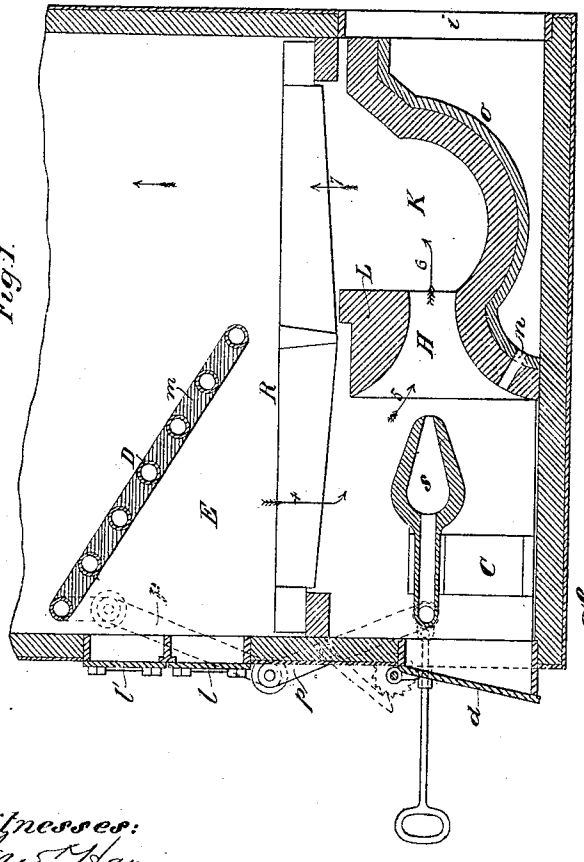
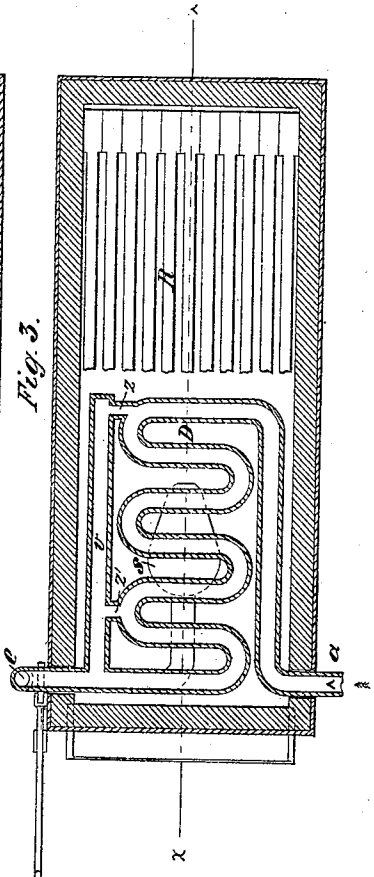


Fig. 3.



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# UNITED STATES PATENT OFFICE.

CLAUS RUSSMANN, OF HAMBURG, GERMANY.

## FURNACE.

SPECIFICATION forming part of Letters Patent No. 269,720, dated December 26, 1882.

Application filed October 5, 1882. (No model.)

*To all whom it may concern:*

Be it known that I, CLAUS RUSSMANN, of Hamburg, in the Empire of Germany, have invented certain Improvements in Furnaces, of which the following is a specification.

The invention, which is applicable to furnaces for steam-boilers and other purposes, consists in a novel combination, with the furnace-grate, of an open bridge-wall below the grate, a coil or tube above the grate for heating or generating gas, and a nozzle connected with the said coil or tube to deliver heated gas therefrom below the grate and in front of the open bridge-wall, to produce a downward draft of gas from the fuel on the front part of the grate, and a mixture of the said gas with the gas from the coil, and a perfect combustion of the two gases.

In the accompanying drawings, Figure 1 shows a longitudinal section on the line *x x*, Fig. 3. Fig. 2 is an end view, with the feed-pipe partly in section. Fig. 3 is a horizontal section, showing the coiled heating-pipe and a portion of the grate.

In the fire-box, above the grate R, which may be of any convenient construction, there is placed a tube, D, coiled or bent in zigzag or serpentine form in a plane. The free space between the coils of the said tube is filled up with fire-proof material *m*, as will be understood with reference to the drawings, Fig. 1. This tube or coil D, which is placed inclined above the fire-grate R, has at its upper end an entrance-opening, *a*, and an exit-opening, *e*, at the side opposite to *a*, which opening *e* is, by means of joint-tubes *p*, connected with a nozzle, *s*, placed underneath the front part of the grate and supported by a sliding standard, C, which can by means of a handle or other device be slid forward or backward to bring the nozzle *s* nearer to or to remove it farther from an opening, H, formed into a bridge or partition wall, L, that is placed across the ash-pit underneath grate R.

*l* and *l'* are fire-doors fitted to inlets provided in the front of the fire-box for the admission of air to keep a fire burning on the front part of the grate R beneath the coil or tube D.

Instead of making the nozzle *s* slidable, the bridge or wall L may be arranged to be movable for the purpose of varying and regulating the distance between the nozzle *s* and opening H.

For operating the furnace, a fire of coal or other fuel is lighted on the front part of the grate R, and through the opening *a* of the tube or coil D gas or a hydrocarbon liquid is introduced into the said tube or coil. The gas or the liquid circulates in the tube or coil, and is heated therein by the fire on grate R, and rushes in form of heated gas out of nozzle *s* into opening H, and generates a strong blast, which draws the heated air and gases from above the fuel on the front part of the grate downward through the latter, as indicated by the arrow 4, Fig. 1. The said blast of gas from the nozzle *s* mixes with the heated air and gases coming down through the front part of the grate, and the mixture, becoming ignited, is driven forward through the opening H in the bridge-wall L, as indicated by the arrows 5 6, and passes upward, as indicated by the arrow 7, through the rear part of grate behind the tube or coil D, from whence it may be led through flues, or may be used directly for any heating purpose generally.

The space K behind the bridge-wall L and below the rear part of the grate must be set or lined with fire-proof material, which may be fastened or arranged upon a cast-iron support, *o*, that can be introduced through an opening, *i*, in the hinder wall of the furnace.

If it should be desirable in certain cases to introduce atmospheric air underneath grate R, this can be done by forming openings *n* in bracket *o* and the fire-proof lining; or such air may be introduced through a door, *d*, arranged in front of the ash-pit.

In order that, in case hydrocarbon liquid is introduced into D through opening *a*, the said liquid, in beginning the operation, when D is still cold, may be prevented from passing down into nozzle *s*, the tube or coil D is placed in connection with a tube, *v*, by passages *z* and *z'*, and until the liquid has been generated into steam or gas only a small quantity of liquid is introduced into D, and this liquid circulates from a trough, *z v z'*, into D, and thence again, the way described, till it is formed into gas, when it will escape through the higher situated opening *e* and descend through pipes *p* into nozzle *s*, as before described.

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

1. The combination, with the grate of a furnace, of a gas-generating or heating coil arranged above the grate, a bridge-wall arranged below the grate and having an opening through it, and a nozzle connected with said coil and placed below the grate in front of the opening in the bridge-wall, all substantially as and for the purpose herein specified.

2. The combination of the grate R, the transverse bridge-wall L, having an opening, H, the inclined coil D, the adjustable nozzle *s*, and the joint-tubes *p p*, all substantially as and for the purpose herein described.

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