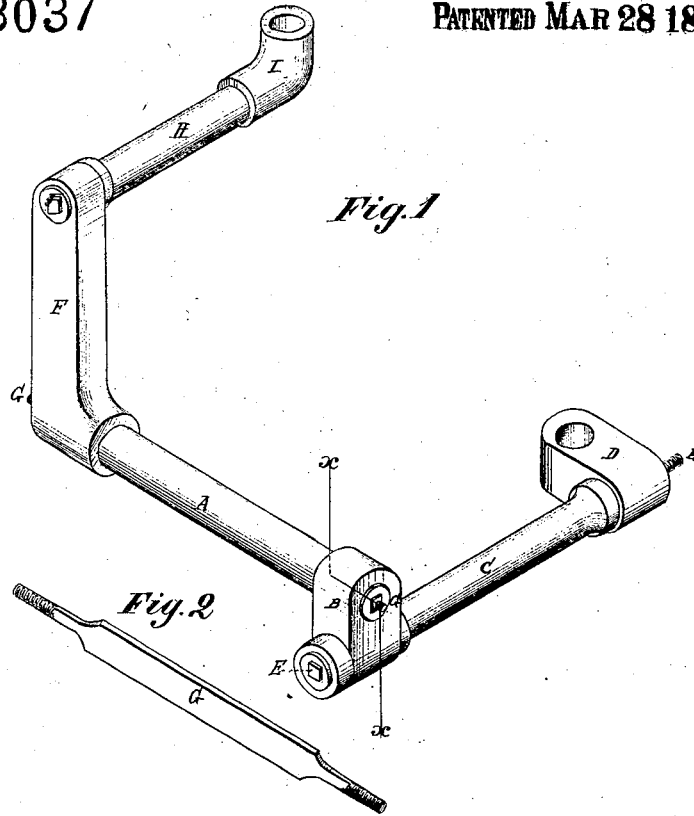


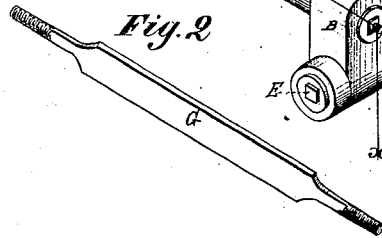
*Capt. W. H. Farris. Grate Bars.*

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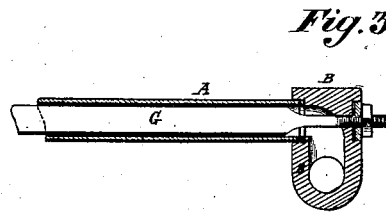
PATENTED MAR 28 1871



*Fig. 1*



*Fig. 2*



*Fig. 3*

Witnesses:

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Inventor:

*Capt. W. H. Farris.*

PER

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# UNITED STATES PATENT OFFICE.

WILLIAM H. FARRIS, OF CAIRO, ILLINOIS.

## IMPROVEMENT IN WATER-GRATE BARS.

Specification forming part of Letters Patent No. 113,037, dated March 28, 1871.

### *To all whom it may concern:*

Be it known that I, Captain WILLIAM H. FARRIS, of Cairo, in the county of Alexander and State of Illinois, have invented a new and useful Improvement in Grate-Bars; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawing forming part of this specification, in which—

Figure 1 is a perspective view of one of my improved grate-bars, with its fittings and connections.

Figure 2 is a detail perspective view of the stiffener.

Figure 3 is a detail sectional view taken through the line *x x*, fig. 1.

Similar letters of reference indicate corresponding parts.

My invention has for its object to furnish an improved grate-bar for the furnaces of steam-boilers; which shall be so constructed as to allow water to circulate through it and the boiler to protect the bars from the intense heat of the fire, and to assist in heating the water and generating steam; and

It consists in the construction and combination of various parts, as hereinafter more fully described.

A is the grate-bar, which is made tubular in form to allow water to circulate through it.

The forward end of the bar A enters a countersunk seat in the inner side of the head B.

C is a pipe, which passes through the side wall of the furnace, and to the outer end of which is attached an elbow, D, from which a pipe extends to the lowest part of the boiler, to receive water from the boiler and conduct it to the hollow grate-bar A.

The inner end of the pipe D is connected with an opening in the side of the head B, which opening communicates with the grate-bar A.

Upon the other side of the head B is formed a similar opening, to be connected with the opening in the side of the head of the adjacent bar, and so on through all the bars of the grate.

The connections at the forward ends of the bars A are secured and held in place by a rod, E, extending through them and through the

pipe C, and having a head upon one end and a nut upon its other end.

The other or rear end of the hollow grate-bar A enters a countersunk seat in the forward side of the lower end of the back bar F, which extends up vertically or with a slight rearward inclination, and which, in connection with the back bars of the other grate-bars, forms the back wall of the fire-chamber.

The grate-bar A is secured in place in connection with the head B and back bar F, by a bar, G, which passes longitudinally through the grate-bar A, and through the head B and lower end of the back bar F.

The part of the bar G that passes through the grate-bar A is made thin, and of such a breadth as to fit into the interior of the grate-bar A, where it is arranged vertically, as shown in fig. 3, to serve as a stiffener to said grate-bar, to resist the tendency of the bar A to be sprung or warped by the heat.

H is a pipe, which passes through the side wall of the furnace, and has an elbow, I, attached to its outer end to receive the end of the pipe that connects it with the upper part of the boiler.

The inner end of the pipe H is connected with an opening in the side of the back bar F, a similar opening being formed in the other side of the upper end of the said back bar F, to adapt it to be connected with the upper end of the back bar of the adjacent grate-bar.

The connections at the upper ends of the back bars F are secured by a rod, J, in the same manner as the connections at the forward end of the grate-bars A are secured by the rod E.

In case it is desired to have the forward ends of the grate-bars A free or unconnected with each other, the heads B may be made solid, and the pipe C and elbow D may be connected with the lower part of the back bars F, in the same manner as they have been described as being connected with the heads B.

These connections or fittings are all made alike, so that they will fit accurately however they may be connected.

The connections exposed to the heat of the fire are made with gasket-joints, as less liable to be injured by the intense heat to which they are exposed.

In case the grate-bars A should be warped

or sprung by the heat, by loosening the nuts upon the stiffener G the bar A may be turned to expose another part of the fire.

Having thus described my invention,

I claim as new and desire to secure by Letters Patent—

1. The hollow upright back bars F, in combination with the hollow grate-bars A, substantially as herein shown and described, and for the purpose set forth.

2. The stiffener G, constructed as herein shown and described, in combination with the tubular grate-bars A, substantially as herein

shown and described, and for the purpose set forth.

3. The combination of the elbow I, pipe H, back bar F, rod J, tubular grate-bar A, stiffener G, head B, pipe C, and elbow D, with each other, and whether the pipe C be connected with the head B or back bar F, substantially as herein shown and described, and for the purpose set forth.

CAPT. WM. H. FARRIS.

Witnesses:

JAS. B. FULTON,  
W. H. MORRIS.