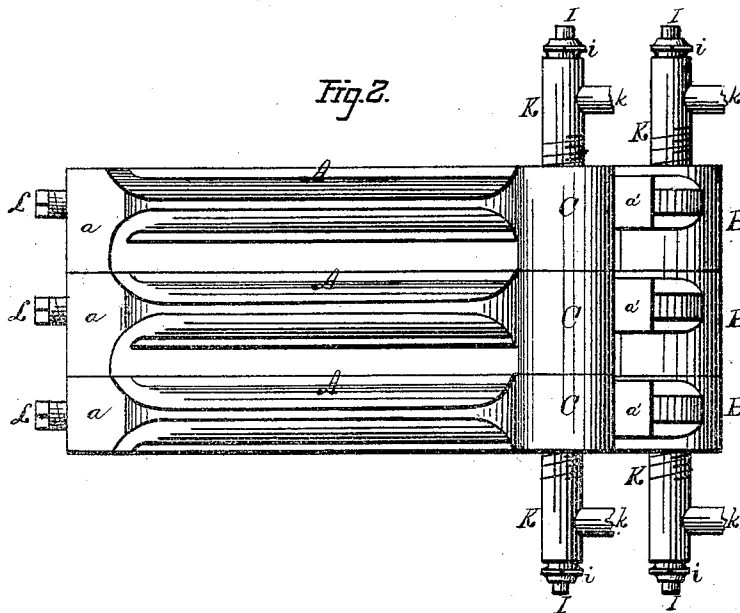
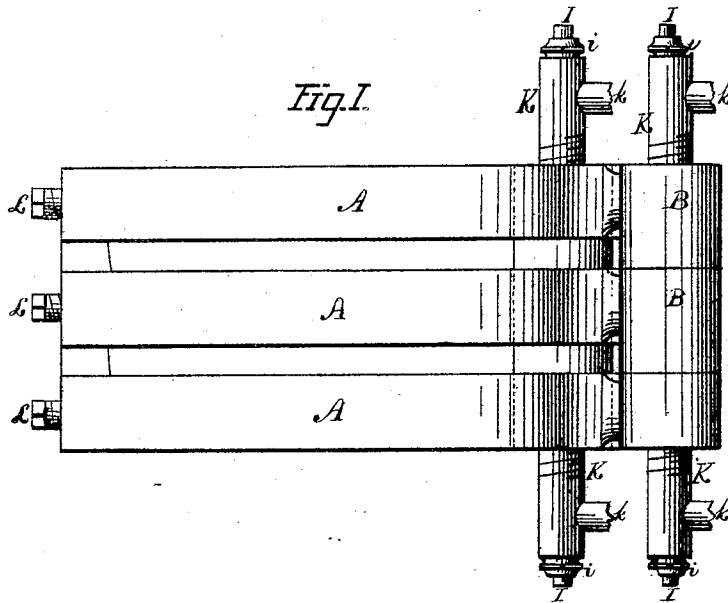


W. H. FARRIS.
Fire-Grates.

No. 141,780.

Patented August 12, 1873.



WITNESSES:

*Jas. E. Hutchinson
 John R. Young*

INVENTOR.

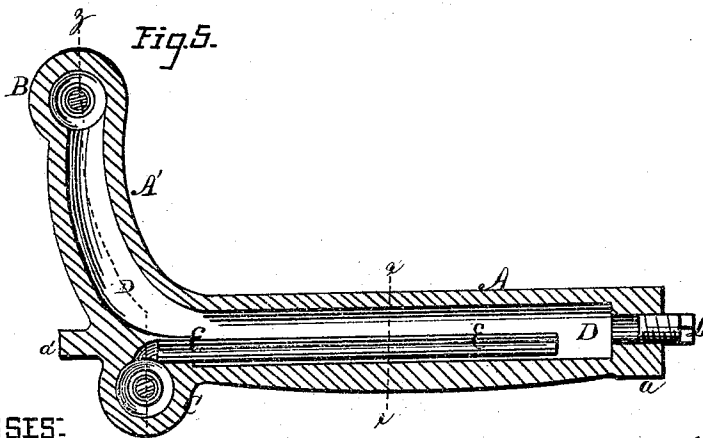
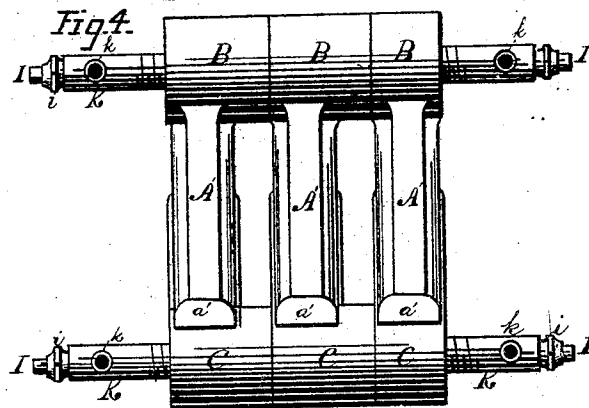
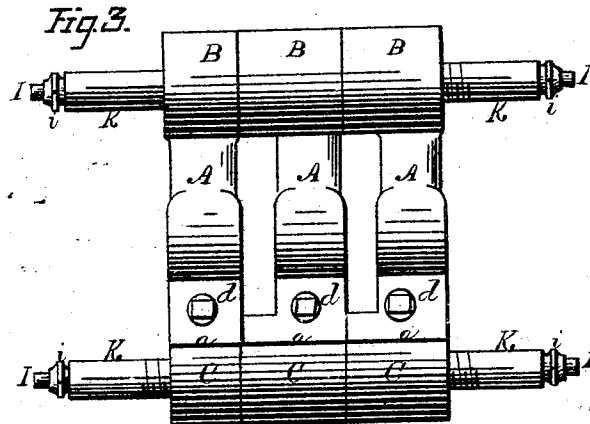
*Wm. H. Farris, by
 Prindle and Co. his*

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Fig. 6.

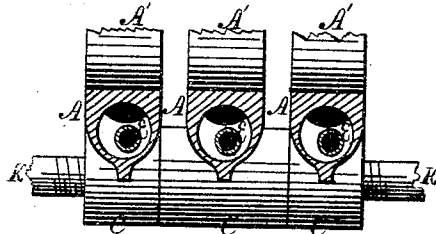
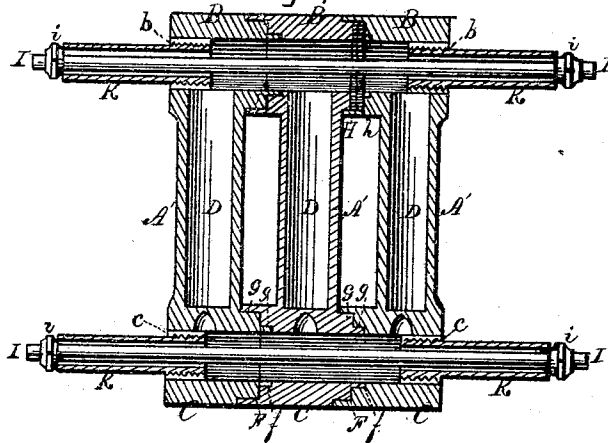


Fig. 7.



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UNITED STATES PATENT OFFICE.

WILLIAM H. FARRIS, OF CAIRO, ILLINOIS.

IMPROVEMENT IN FIRE-GRATES.

Specification forming part of Letters Patent No. 141,780, dated August 12, 1873; application filed May 31, 1873.

To all whom it may concern:

Be it known that I, WILLIAM H. FARRIS, of Cairo, in the county of Alexander and State of Illinois, have invented certain new and useful Improvements in Fire-Grates; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings making a part of this specification, in which—

Figure 1 is a plan view of the upper side of my improved bars. Fig. 2 is a like view of the lower side of the same. Figs. 3 and 4 are, respectively, elevations of the front and rear ends of said bars. Fig. 5 is a vertical longitudinal section upon a line passing through the center of one of the bars; and Figs. 6 and 7 are cross-sections upon lines *xx* and *zz*, respectively, of Fig. 5.

Letters of like name and kind refer to like parts in each of the figures.

The object of my invention is to utilize the waste heat of a furnace and to increase the durability of grate-bars by circulating water from the boiler through suitable openings in said bars; and it consists, principally, in the peculiar construction of the grate-bars, substantially as and for the purpose hereinafter specified. It consists, further, in combining with the bearing-faces soft metal and rubber gaskets, substantially as and for the purpose hereinafter shown and described. It consists, further, in the means employed for confining said grate-bars in relative lateral positions, substantially as and for the purpose hereinafter specified. It consists, finally, in the grate as a whole, when its several parts are constructed as shown, and combined with each other and with the boiler in the manner and for the purpose substantially as is hereinafter set forth.

In the annexed drawings, A represents a grate-bar, having the form in cross-section shown in Fig. 6, the rear end of which, A', extends upward in a curve, as seen in Fig. 5, and terminates in a cylindrical enlargement, B, the axis of which is placed horizontally and in a line having a right angle to the line of said bar. A similar enlargement or boss, C, is formed at the lower side of said bar, at the point where the upward curve of the rear portion commences. At its front end and lower side the grate-bar is made plane and horizontal, and

forms a bearing-face, *a*, upon which said end rests, while at its rear end a lug, *a'*, which extends horizontally rearward, furnishes a means for supporting the rear portion of said bar. Within each grate-bar, thus constructed in one piece, is provided an opening, D, which transversely is round, and longitudinally corresponds to the general shape of the bar, its upper rear end communicating with a horizontal central opening in the enlargement B, while its forward end terminates near the corresponding end of said bar. The lower enlargement is also provided with a central opening, that at its upper side communicates with a tube, E, which tube from thence extends forward within the opening D, and terminates near the front end of the latter. By this arrangement it will be seen that water entering the opening in the lower enlargement C will pass forward through the tube E into the opening D, and backward through the latter to the upper enlargement B, through which it will be discharged, during which passage said water will have been brought into contact with said bar along the entire portion exposed to the action of the fire. Upon one side of each bar the cylindrical enlargements B and C are made flush, while upon the opposite side said enlargements project outward to a distance equal to the space between said bar and the adjacent bar, and within each of said projecting portions is provided a cylindrical recess, F and *f*, having a larger and a smaller size, which corresponds to and receives the projecting face G and *g* of the boss of the contiguous bar, the whole forming a packing-joint between said bars. Between the vertical or bearing faces of the recess F and the projection G is placed a gasket of rubber, H, and a ring or gasket of round copper wire, *h*, after which the grate-bars are firmly pressed together by means of a bolt, I, that passes through the center of the openings in the bosses B and C. The wire gasket has such a size as to cause it to closely embrace the outer edge of the rubber gasket when the bearing-faces are forced together, by which means said rubber is protected from the injurious effects of the heated escaping products of combustion, and at the same time is protected from such compression as to destroy its elasticity.

While it is true that either the rubber or the

copper gasket separately will form a water or steam joint, it is found that combined they enable such joint to be more quickly and easily made, and when completed said joint is more durable than would otherwise be the case. Within the openings *b* and *c* of each outer grate-bar is secured a pipe, *K*, which is closed at its outer end, except where the clamping-bolt *I* passes through. The nuts *i* of said bolts are made convex upon their inner faces, and fit into corresponding recesses in the ends of said pipes, so that, when screwed to place, a tight joint is produced. A suitable branch, *k*, upon one side of each pipe *K*, enables the necessary connections to be made between the same and the boiler. The grate is now complete, and operates as follows:

The lower pipes *K* are connected with the lower portion of the boiler, while the upper pipes *K'* are connected to said boiler at or near the water-line. The water now enters at the rear end of the horizontal portion of each grate-bar, passes to the front end of the same through the inner pipe, and from thence rearward and then upward, and is discharged into the boiler, having, during such passage through the grate-bars, acquired a high temperature from heat that would not only have been otherwise wasted, but which, from its intensity, would have materially injured said bars, said circulation of the water being caused by the action of the heat, which raises its temperature and causes it to pass upward with considerable rapidity and force.

For convenience in removing sediment from the interior of the grate-bars, an opening, *L*, is provided in the front end of each, and when not in use is closed by means of a metal plug, *l*.

The apparatus thus constructed is simple, efficient, and durable, and in the end is much less expensive than the grate-bars ordinarily used.

Having thus fully set forth the nature and merits of my invention, what I claim as new is—

1. The grate-bars *A*, constructed as shown, provided with plane horizontal upper surfaces and having at the rear end of each a bearing-lug, *a'*, substantially as and for the purpose specified.

2. In combination with the bearing-faces *F* and *G*, the rubber gasket *H* and soft-metal gasket *h*, substantially as and for the purpose shown.

3. The means employed for securing together the grate-bars, consisting of the rods *I* passing through openings *b* and *c* and through the pipes *K* and *K'*, and provided upon their threaded ends with conical nuts *i*, which fit into corresponding seats in said pipes, substantially as specified.

4. The grate-bars *A* and *A'*, constructed as shown, provided with the bearing-faces *F* and *G* combined to form a whole by means of the rods *I* and nuts *i*, and connected to or with a boiler by the pipes *K* and *K'*, substantially as and for the purpose set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 30th day of April, 1873.

WILLIAM H. FARRIS.

Witnesses:

W. H. MORRIS,
J. B. HUMPHREYS.