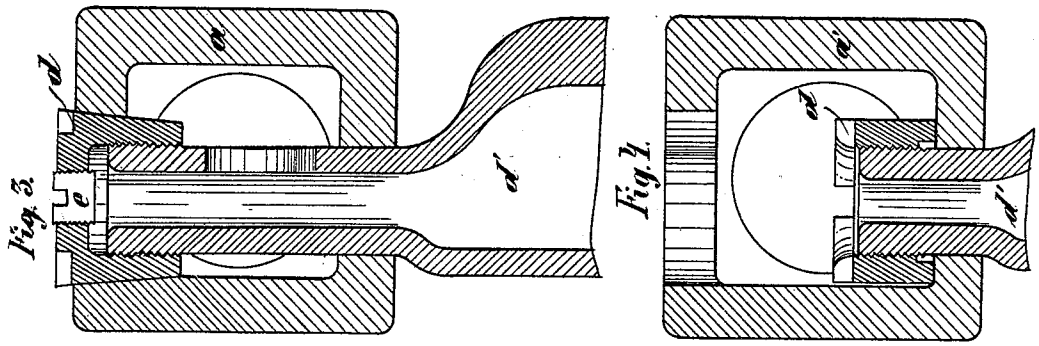
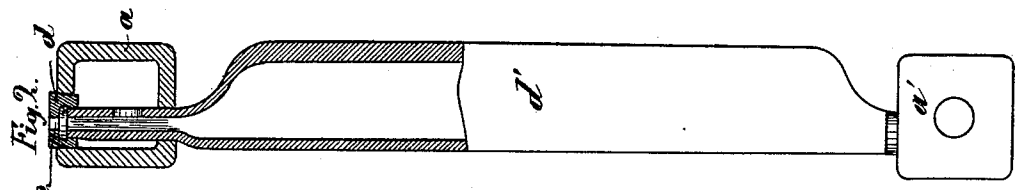
(No Model.)

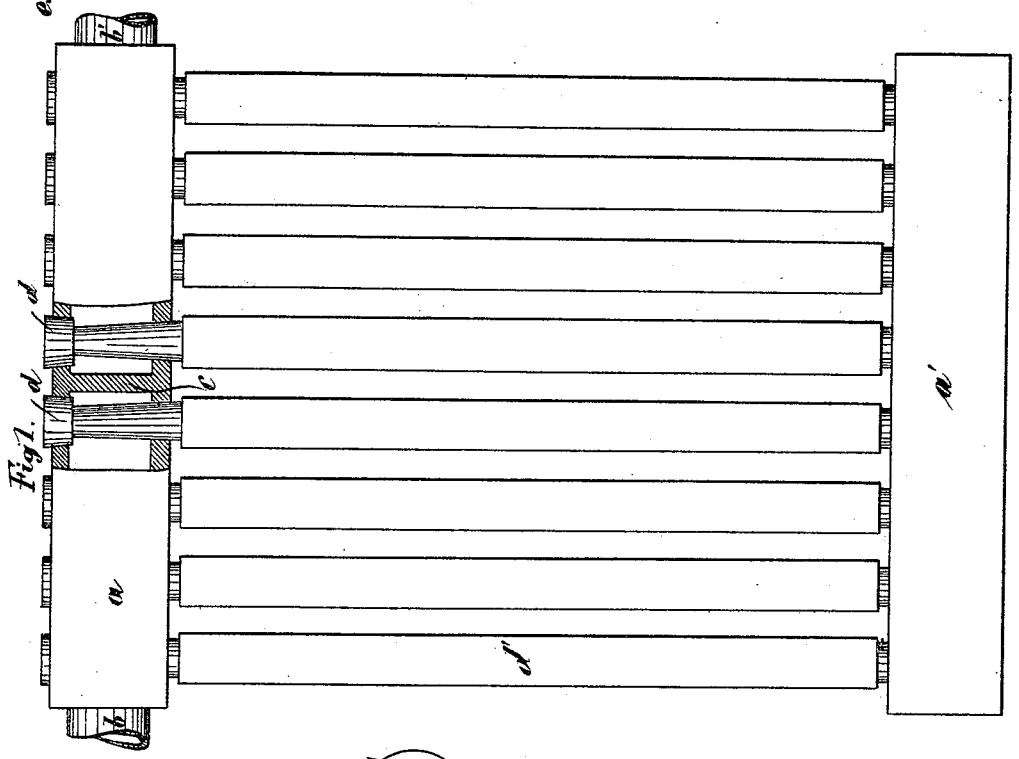
J. H. MEHRTENS.

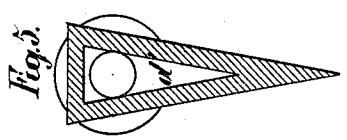
FIRE GRATE.

No. 481,237. Patented Aug. 23, 1892.









Witnesses:
Wm. Schulz
A. Youghmans.

Inventor:
J. H. Mehrtens
by his attorneys
Roeder & Briesen

UNITED STATES PATENT OFFICE.

JOHN H. MEHRTENS, OF HARKORTEN, NEAR HASPE, GERMANY, ASSIGNOR TO ERNST JOSEPH KÖSTER, OF SAME PLACE.

FIRE-GRATE.

SPECIFICATION forming part of Letters Patent No. 481,237, dated August 23, 1892.

Application filed January 28, 1892. Serial No. 419,502. (No model.)

To all whom it may concern:

Be it known that I, JOHN H. MEHRTENS, a citizen of the free city of Bremen, German Empire, residing at Harkorten, near Haspe, in the Kingdom of Prussia, German Empire, have invented new and useful Improvements in Fire-Grates, of which the following is a specification.

The object of this invention is the better to utilize fuel in heating apparatus by the employment of a grate offering the following advantages: First, a grate may at any time be readily cleaned, as, owing to its peculiar arrangement, no slag can adhere to it, but only solidifies as soon as it comes into contact with the cooled surfaces of the grate; second, hot air may be conducted under the grate and the direction of the flames may be reversed, so that the flame may enter and pass through the spaces between the bars which it could not be made to do in grates as hitherto used; third, thicker layers of fuel may be employed, which enables not only a minimum excess of blast or draft but also inferior qualities of fuel to be made serviceable; fourth, the step-like arrangement of the grate renders it exceedingly useful where small coal apt to produce much slag has to be employed; and, fifth, the surface of this grate may be comparatively smaller than that of other grates, as, owing to the bright flame it enables constantly to be kept up, the heating-power is considerably increased.

Up to the present time fire-grates arranged for internal cooling where it was important to retain the characteristic form of the bars in section have always been cast, and in consequence rather wide bars have been produced and the open spaces between them diminished in proportion. The whole of the old arrangements, moreover, were somewhat heavy and the bars were only interchangeable with difficulty. Where wrought-iron was employed ordinary cylindrical tubes were generally employed, which shape is altogether unsuited for the accomplishment of the essential object of the grate, as it necessarily narrows to a considerable extent the open spaces, while at the same time offering but an unsatisfactory supporting-surface for the fuel.

In the manufacture of the improved fire-grate herein described wrought iron or steel is preferably employed.

In the accompanying drawings, Figure 1 is an elevation of the grate; Fig. 2, an end view, partly in section; Figs. 3 and 4 longitudinal sections through the ends of two of the bars, and Fig. 5 a cross-section through the bar.

The bars d' of the grate are hollow and so wrought or forged as to have terminal trunnions fitting suitable bearings in the cross-pieces $a\,a'$, nuts d and keys e being preferably used to secure them in position therein; or the trunnions of the bars may be unprovided with any screw-threads, the preferable arrangement being to have the two external or outermost bars screw-threaded and fitted into nuts and the remaining bars made plain, two screw-nuts being sufficient to insure the necessary tightness and firmness of the whole grate. In cases where the exchange or replacement of the bars is known beforehand to be superfluous the terminal trunnions may be tapered and driven or wedged into the transverse carriers, whereby of course the grate will be rendered still more rigid and secure. The cooling liquid enters at b and fills the hollow space or chamber a up to the wall or partition c, from thence through openings provided in the trunnions or ends of the bars, as shown in Figs. 2, 3, and 4, it passes into the bars themselves. After thus filling the whole of the hollow cross-piece a' it passes through the remaining grate-bars into the other compartment of a, whereupon it preferably issues from the grate at b', though it may be discharged at any convenient point of the sides of the transverse pipe or chamber a if more than one partition c is provided in it or if no partitions at all are used. In their central parts the bars assume the shape in section shown in Fig. 5, while at the ends forming the trunnions they are considerably contracted and present a different shape in section. The wider space situated on a lower level than the bars of the trunnions in the center facilitates the circulation of the cooling liquid, which is thereby enabled to flow more rapidly and to be heated to a higher degree than it is in the trunnions and in the

transverse pipes. Besides, the wider central space, by enabling a larger quantity of cooling liquid to collect in the main body of each bar, prevents the bars from becoming red-hot too quickly should a momentary interruption occur in the feeding of the liquid. Again, the widened or expanded portion of the grate practically prevents obstruction, the impurities, if any, collecting at the bottom of it. It is exceedingly easy to take the grate to pieces for cleaning or similar purposes.

It will be seen that this grate essentially differs from all existing grates both in object and construction, and in this connection I would particularly point out that the hollow bars are actually formed as grate-bars should be and are not wholly or partly cylindrical, for it is well known that cylindrical bars offer the most favorable surfaces of adhesion to slag, which, being thus allowed to accumulate, frequently forms big lumps or excrescences in all directions, which seriously interfere with the operation of the furnace and are apt, through the strain they necessitate in stoking and cleaning, to make the bars become loose. Another feature common to all tubular grate-bars hitherto employed is that they have the same inner diameter or capacity from end to end, the consequence being that very wide spaces have to be left between them, and when such a bar is disconnected it is scarcely recognizable as a grate-bar at all. The bars of this improved grate, on the contrary, are considerably reduced or contracted at the ends in comparison with their central or main portion.

Hollow grates have before been devised for the circulation of hot water or steam which it was their object to convey directly into the boiler, so that they were really used as a preliminary or feed-water heating apparatus. The present fire-grate is intended to fulfill no such function, but merely to enable the heating operation to be better carried out, and this result is fully insured by the one circumstance alone that the water circulating through the grate repels the slag, so that it can neither agglomerate nor adhere to the bars, but splits up into small fragments.

Having now particularly described and ascertained the nature of the said invention and in what manner the same is to be performed, I declare that what I claim is—

A hollow fire-grate adapted to have water circulated through it to prevent the burning on of slag, characterized by the combination of hollow grate-bars d', having reduced perforated ends, with the hollow side bars receiving such ends and with nuts d for attaching the grate-bars to the side bars, substantially as specified.

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

JOHN H. MEHRTENS.

Witnesses:
WM. ESSENWEIN,
RUDOLPH FRICKE.