No. 719,358. PATENTED JAN. 27, 1903.

J. C. McDONALD.

FIRE RAKING APPARATUS.

APPLICATION FILED APR. 26, 1902.

NO MODEL.

Fig. 1.

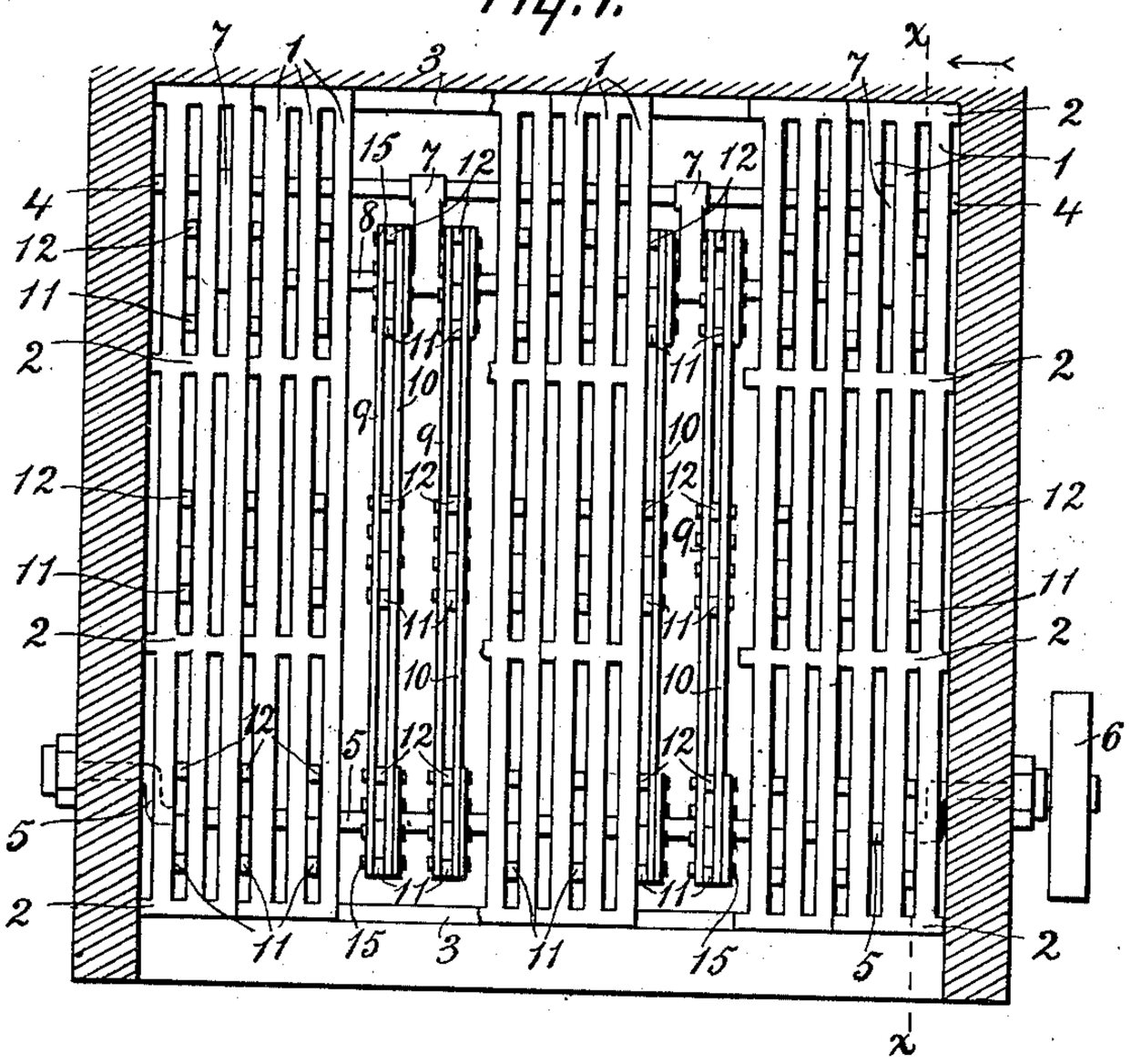
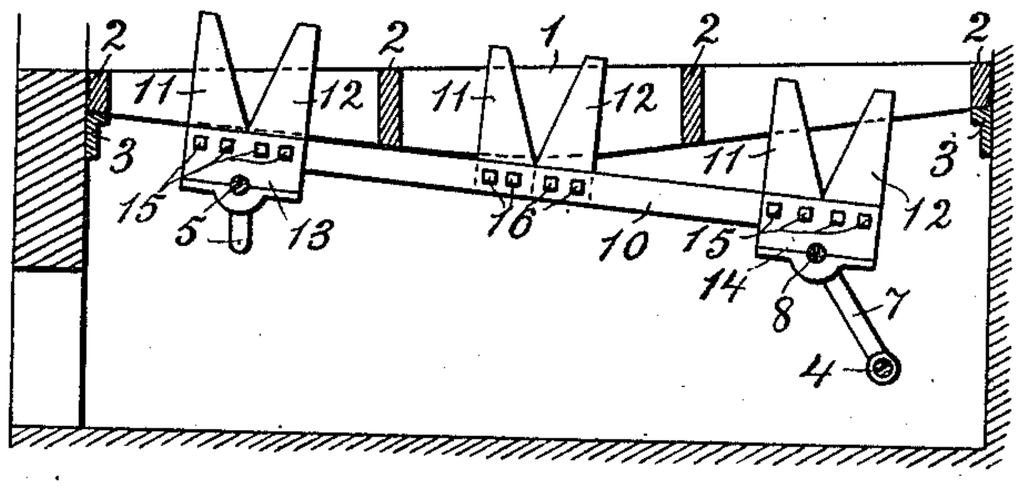


Fig. 2.



Witnesses
Wm. H. Shaw.
Arthur E. Baker.

Inventor
James C. McDonald.
By his Attorney
Daniel A. Carpenter.

UNITED STATES PATENT OFFICE.

JAMES C. McDONALD, OF SIDNEY, NEW YORK, ASSIGNOR OF ONE-HALF TO EDWARD W. GATES, OF SIDNEY, NEW YORK.

FIRE-RAKING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 719,358, dated January 27, 1903.

Application filed April 26, 1902. Serial No. 104,755. (No model.)

To all whom it may concern:

Be it known that I, JAMES C. McDONALD, a citizen of the United States, and a resident of Sidney, in the county of Delaware and State of New York, have invented a certain new and useful Improvement in Fire-Raking Apparatus, of which the following is a full, clear, and exact description, reference being made to the accompanying drawings, forming part of this specification.

This invention relates to improvements in apparatus which is secured under and between the bars of a fire-grate and which comprises devices that are movable to and fro between the grate-bars and that act like a rake on the ashes of a fire on the grate; and the invention consists of the peculiar fire-raking apparatus hereinafter described and claimed.

On the accompanying sheet of drawings, Figure 1 is a broken plan of the grate of a furnace and apparatus embodying the invention; and Fig. 2, a vertical section thereof on the plane *x x*, Fig. 1, viewed in the direction indicated by the arrow at the top of Fig. 1.

Similar reference-numerals designate like parts in both views.

This invention is especially intended to facilitate the sifting of ashes through a large fire-grate, such as the grate of a furnace. It enables ashes to be readily sifted through a simple grate like that shown and so evenly and thoroughly as to secure a better fire than is commonly maintained either on a grate which comprises a part or parts that must be rocked or otherwise moved to sift the ashes or on a grate through which the ashes must be worked with a poker. This apparatus resembles in some respects the device patented in Letters Patent No. 695,757, dated March 18, 1902, but differs from it in construction to such an extent as to render this apparatus superior to the patented device in operation and useful in connection with grates to which the patented device could not be applied.

The particular grate shown is composed of sections, there being in each section three bars 1, which extend from end to end of the grate, and four cross-bars 2. These sections fit together, as appears by Fig. 1, and rest at their ends on supports 3, attached to the walls of the furnace.

The raking apparatus comprises a rod 4 and crank-shaft 5, which extend across the ash-pit under the rear and front portions, respectively, of the grate, the rod being fixed in the walls and the crank-shaft extending through the walls and through bearings attached to or inserted in them and having on it at one end a device—such, for example, as the fast pulley 6—by means of which the crank-shaft can be revolved with power derived from an engine or other source. On the rod 4 are links 7, and these links are connected at their upper ends with a rod 8, which is parallel with the rod 4, the distance between the axes of the rods being greater than the length of the crank on the crank-shaft 5. Rake-bars, which are composed of thin bars 9 and 10, between which are fixed teeth 11 and 12, made, preferably, from boiler-iron, are mounted on the crank-shaft 5 and rod 8, on which are bearing-blocks 13 and 14, which are attached to the rake-bars. The bars 9 and 10 and the teeth and bearing-boxes of each rake-bar are bolted together with bolts 15 and 16, the bolts 15 passing through flanges formed on or affixed to the bearing-boxes, as well as through the bars 9 and 10 and the teeth at the ends of the bars. The rake-bars are wholly below the grate when they are in their highest positions, the teeth being the only parts of the apparatus that extend through or into the grate, and since the teeth extend between the bars 1 of the grate the rake-bars are always so held that the spaces between the bars 9 and 10 are directly under those spaces in the grate in which the teeth act, so even if the rake-bars are close to the grate they do not hinder the ashes from falling through it into the ash-pit.

The crank-shaft is revolved to operate the apparatus. With each revolution of this shaft the rake-bars are carried forward and backward and raised and lowered, the front bearings of the bars traveling in circles on the crank and the rear bearings on the arcs of larger circles whose centers are on the axis of the bar 4 and the length of whose radii is that of the links 7. Consequently the teeth 11 and 12 are moved to and fro and up and down in the grate, through which they extend when they are in their highest positions.

The means for supporting and regulating the movements of the rear ends of the rake-bars is regarded better than inclines and a traveling cross-bar mounted thereon, such as are comprised in the patented device above mentioned, for even when the teeth are embedded in ashes or acting on cinders or other hard substances lodged in the grate the apparatus operates well, whereas the operation of the patented device is seriously impeded by ashes that collect on the inclines and obstruct the upward movement of the raking-frame. Important benefits are derived from the peculiarities in the shape and arrangement of the teeth. Obviously the shape of the teeth renders them strong. It also enables them to be arranged as they are shown, and this arrangement renders them operative close to the cross-bars 2 of the grate and from each cross-bar to the next, so although they cannot pass the cross-bars they can nevertheless rake the fire substantially from end to end of the grate. The V-shaped space between the teeth 11 and 12 of each pair of teeth allows the ashes that fall into it to pass below the grate on both sides of the rake-bar, and the converging edges of the teeth, as well as the parallel edges, act effectively to loosen cinders, pieces of slate, &c., that lodge in the grate. Few, if any, clinkers will be formed above the grate, if the fire is raked thoroughly, since unless there are ashes in which the molten refuse can solidify there it will flow through the grate into the ash-pit. It will be observed that the construction of the rake-bars enables them to be made both light and strong and that their arrangement and the relations between them and the teeth are such that they will seldom, if ever, be exposed to any strain that will not act mainly in the direction of their length. The rake-bars are detachable from the rod 8 and crank-shaft, the lower parts of the bearing-boxes 13 and 14 being removable, so any rake-bar can be removed from the rest of the apparatus to be repaired, if necessary.

The number of rake-bars might be great enough to furnish teeth for all the spaces in the grate, as the links 7 could be made thinner than are shown or forked at their upper ends. Half as many rake-bars as there are grate-bars extending from end to end of the grate are believed to be all that are needed in ordinary cases.

It will be seen that the patented device above mentioned could not be applied to the grate shown or to any grate having cross-bars between its ends, whereas this apparatus would be operative with any grate to which the patented device could be applied. It is believed that as much heat as is commonly obtained in a furnace from any quantity of fuel can be obtained with the aid of this apparatus from a considerably smaller quantity of fuel.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. Fire-raking apparatus comprising rake-bars extending lengthwise of the grate directly underneath the grate-bars, rows of teeth attached to the rake-bars and extending into the grate, and mechanism to actuate the rake-bars endwise, there being directly under the spaces between the grate-bars other spaces in the rows of teeth to afford passages for ashes between the lateral faces of the rake-bars, substantially as described.

2. Fire-raking apparatus comprising: rake-bars secured under a grate and extending lengthwise of the grate; pairs of teeth attached to the rake-bars and extending into the grate, the teeth consisting of flat plates broader at the base than at the top, and the rear edge of the front tooth and the front edge of the rear tooth of each pair converging from the tops of the teeth; and mechanism to actuate the rake-bars endwise; substantially as described.

3. Fire-raking apparatus comprising: rake-bars secured under a grate and extending lengthwise of the grate; teeth attached to the rake-bars and extending into the grate; and mechanism to actuate the rake-bars endwise; the rake-bars having in them spaces that are directly under spaces in the grate and that form passages for ashes; substantially as described.

4. Fire-raking apparatus comprising: rake-bars secured under a grate and extending lengthwise of the grate; teeth attached to the rake-bars and extending into the grate; and mechanism to actuate the rake-bars endwise; each rake-bar comprising two parallel bars, and the teeth of the rake-bar being fixed between said parallel bars; substantially as described.

5. Fire-raking apparatus comprising: rake-bars secured under a grate and extending lengthwise of the grate; pairs of teeth attached to the rake-bars and extending into the grate; and mechanism to actuate the rake-bars endwise; each rake-bar comprising two parallel bars, and two or more pairs of teeth being fixed between said parallel bars, and there being an open space between each pair of teeth and the next pair and between said parallel bars; substantially as described.

6. Fire-raking apparatus comprising: rake-bars secured under a grate and extending lengthwise of the grate, each rake-bar comprising parallel bars 9 and 10; pairs of teeth 11 and 12 fixed between the parallel bars of each rake-bar; and mechanism to actuate the rake-bars endwise; substantially as described.

JAMES C. McDONALD.

In presence of—
WILLIAM H. PIERCE,
GEORGE A. McKINNON.