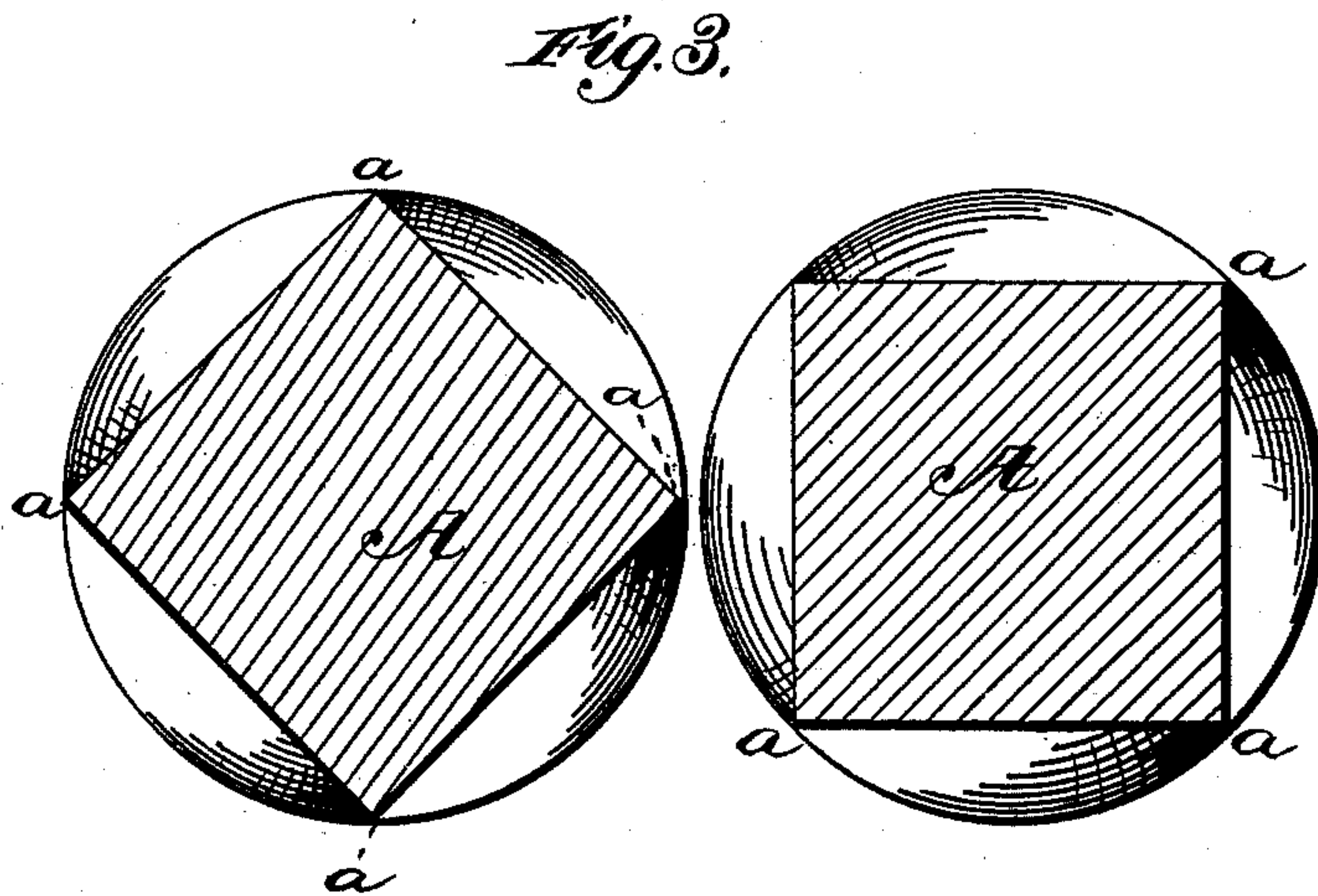
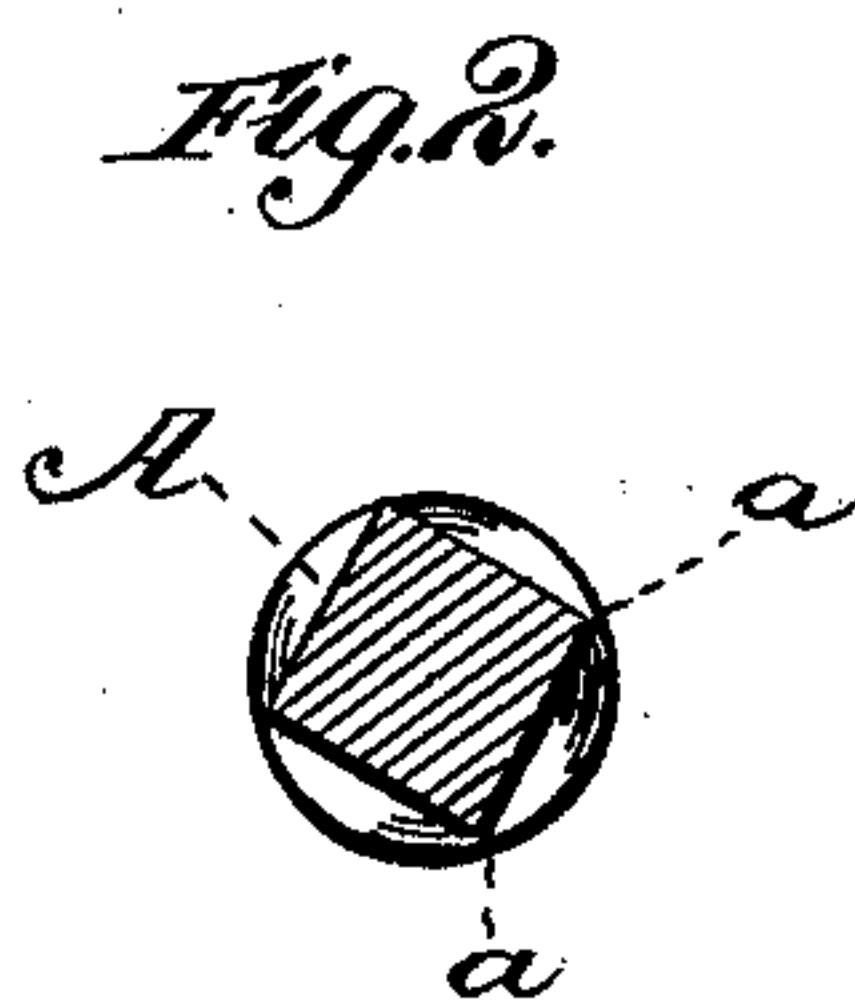
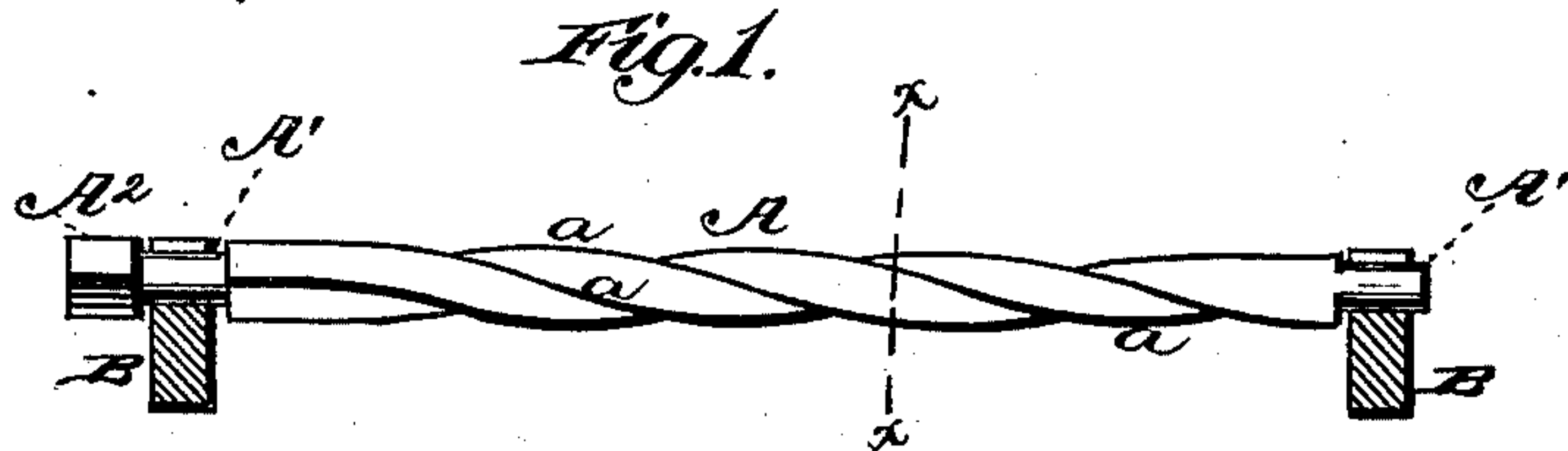


W. H. DOUGHERTY.
Grate-Bar.

No. 222,625.

Patented Dec. 16, 1879.



WITNESSES
Robert Everett
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INVENTOR
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UNITED STATES PATENT OFFICE.

WILLIAM H. DOUGHERTY, OF NEW YORK, N. Y.

IMPROVEMENT IN GRATE-BARS.

Specification forming part of Letters Patent No. **222,625**, dated December 16, 1879; application filed September 9, 1879.

To all whom it may concern:

Be it known that I, WILLIAM H. DOUGHERTY, of the city and State of New York, have invented certain new and useful Improvements relating to Grate-Bars for Steam-Boiler and other Furnaces; and I hereby declare that the following is a full and exact description thereof.

My improvement relates to that class of grates in which the bars are capable of being revolved independently to clear the grate from ashes and clinkers.

I make the several grate-bars of square, triangular, or other section, the faces being equal and having a uniform spiral twist, which presents angles capable of acting strongly on the clinker, and mount the several bars in semi-cylindrical or other suitable recesses in fixed supports or bearers, so that by taking hold of projecting ends with a wrench or other suitable instrument each bar may be rocked, or completely revolved; but, in the use of the previously-known bars of this character, a difficulty has been experienced which it is the object of my invention to avoid. The angles act in a different relation to the adjacent bars at different points in their revolutions, so that in one position a bar will present considerably larger openings for the passage of air than in other positions. It also results that the resistance offered by the clinkers to the turning of the bar is much greater in some positions of the angles than in others. The resistance of a badly-clinkered grate-bar is so great in certain positions that it severely tries the strength of the attendant, and of the wrench or implement with which he operates, while at other points in its revolution the angles will be presented in so different a relation that the resistance will be inconsiderable.

I have discovered that the difficulty may be overcome without involving any serious drawback by simply twisting each grate-bar. I prefer that the degree of twist be slight and uniform.

To manufacture the bars from wrought-iron, the ordinary bars may be simply heated and twisted, giving them, say, half or three-quarters of a complete turn, and taking great care to leave them as straight as possible.

To manufacture the bars from cast-iron, the

pattern or the molds, or both, may be in several pieces, as practiced by founders. I propose, by making the bars with a very slight taper, and the pattern with an absolutely uniform twist, to cast them in an upright position, drawing the pattern from the mold endwise.

The bearings may be made round by turning.

The invention is adapted for steam-boiler furnaces. A series of independent bars rest in notched bearers with overhanging ends, by means of which each may be seized and turned without disturbing the others. Each bar has equal faces, and presents a uniform spiral twist.

The accompanying drawings form a part of this specification.

Figure 1 is a side elevation of my improved bar with a section of the supporting-bearers; Fig. 2, a cross-section of the bar alone on the line *xx*, and Fig. 3 is an outline diagram illustrating the effect.

Similar letters of reference indicate corresponding parts in all the figures.

The main body of the bar is marked *A*, the cylindrical bearings *A'*, and the projecting end *A²*. The angles are marked *a*. The lines indicating the angles are plainly shown in Fig. 1, and are intended to represent a uniform twist in the bar from one end to the other. *B B* are the bearers, deeply notched at the proper distances apart, to strongly support the several bars and allow them to be turned.

It follows from the spiral condition of the several angles that while the angle at one point in the length is in its position of nearest approach to the adjacent bar a flat face is presented at another point in the length, so that the space is greatest between this bar and the next; and that when the bar is rocked or revolved it matters nothing in what position it is left, because the spaces between it and its neighbors are certain to be the maximum at one or more points and the minimum at other points in the length in any position. It also follows that in turning any bar the resistance is nearly uniform, because certain points in the length are certain to be in the position where the bar turns easiest. The resistance to turning is never severe.

I am aware that twisted forms have been

before employed as grate-bars, and without the freedom for independent rotation and exchange which I have provided.

I claim as my invention—

In combination with the bearers B, having open-topped notches, as shown, the independent bars A, of angular section, the faces being equal and having a uniform spiral twist, and protruding each beyond the bearers adapted

to allow of independent shaking and removal, as herein specified.

In testimony whereof I have hereunto set my hand this 2d day of September, 1879, in the presence of two subscribing witnesses.

WILLIAM H. DOUGHERTY.

Witnesses:

W. COLBORNE BROOKES,
CHARLES C. STETSON.