No. 730,772. PATENTED JUNE 9, 1903.

F. & J. F. KERNAN.

GRATE BAR.

APPLICATION FILED SEPT. 3, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. I.

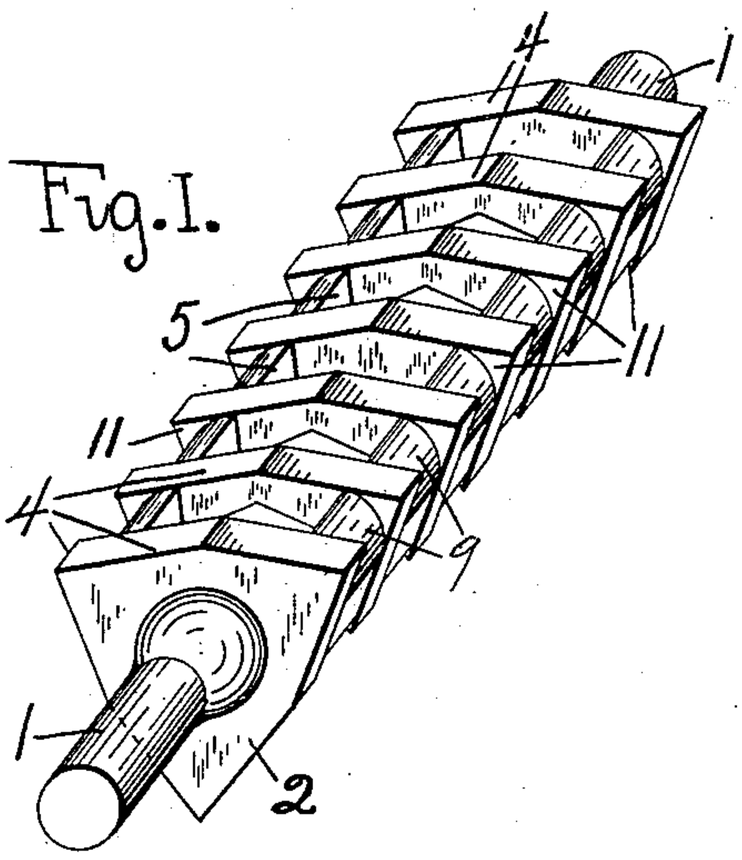


Fig. III.

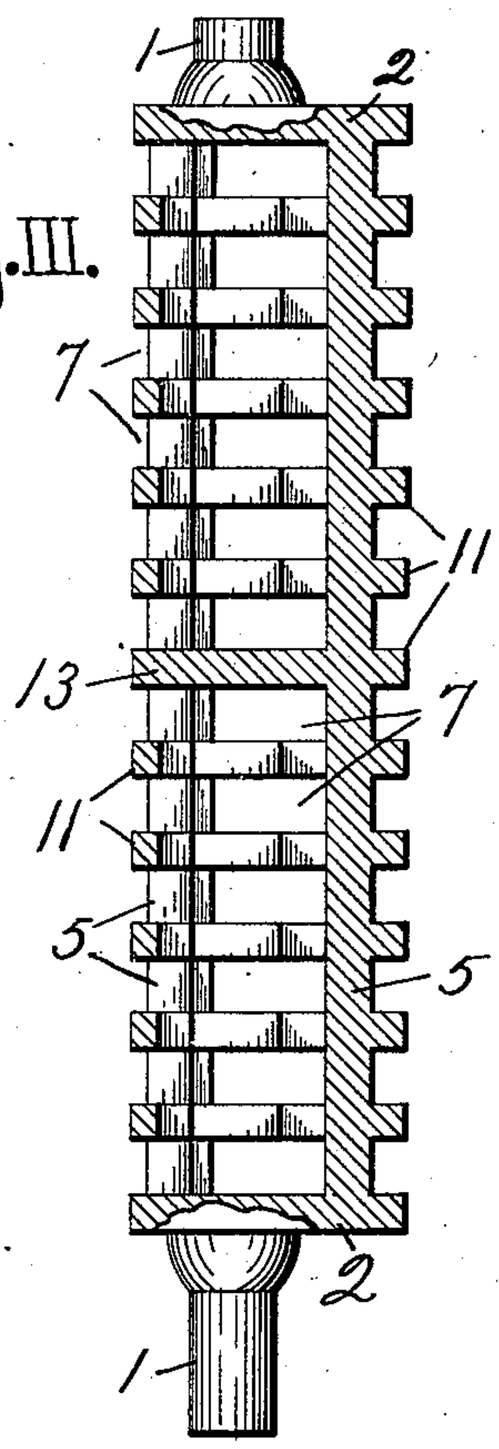


Fig. II.

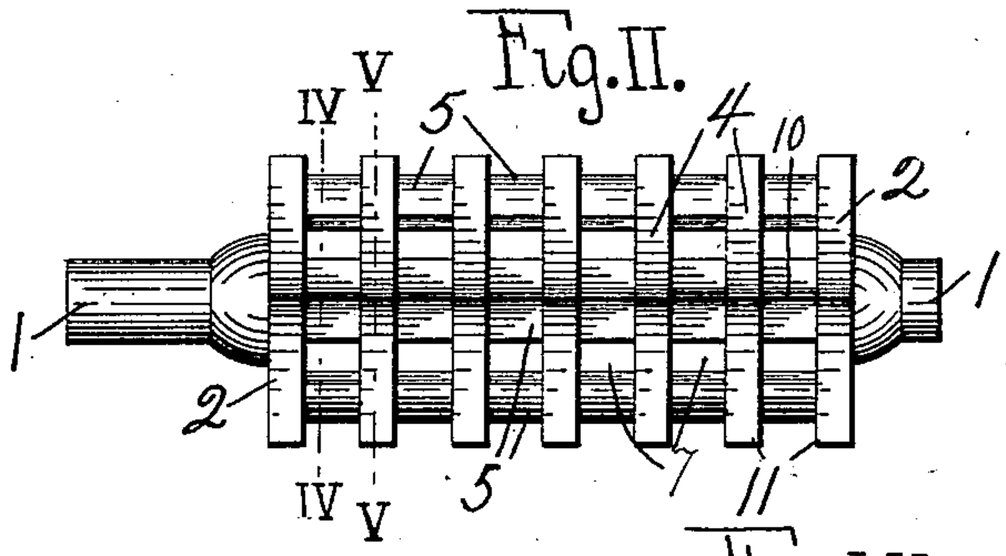


Fig. VI.

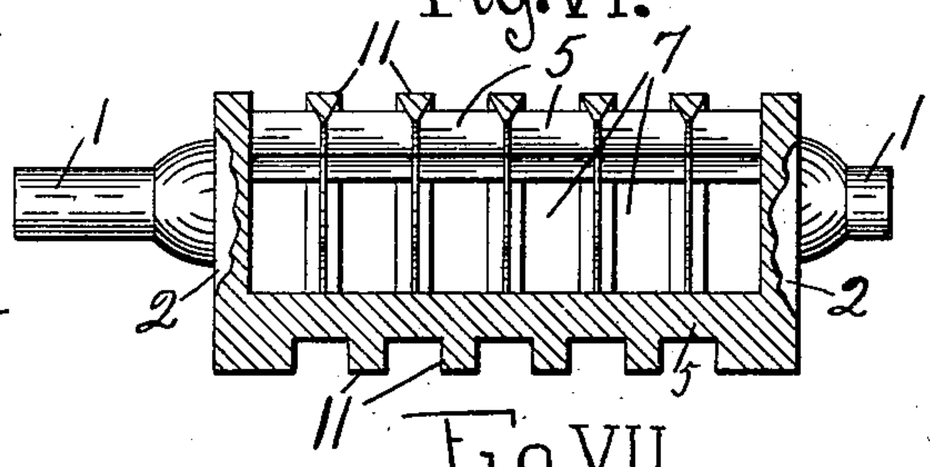


Fig. IV.

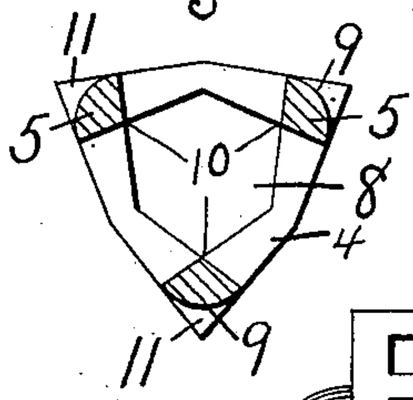


Fig. V.

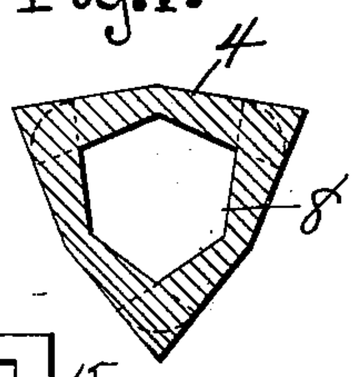
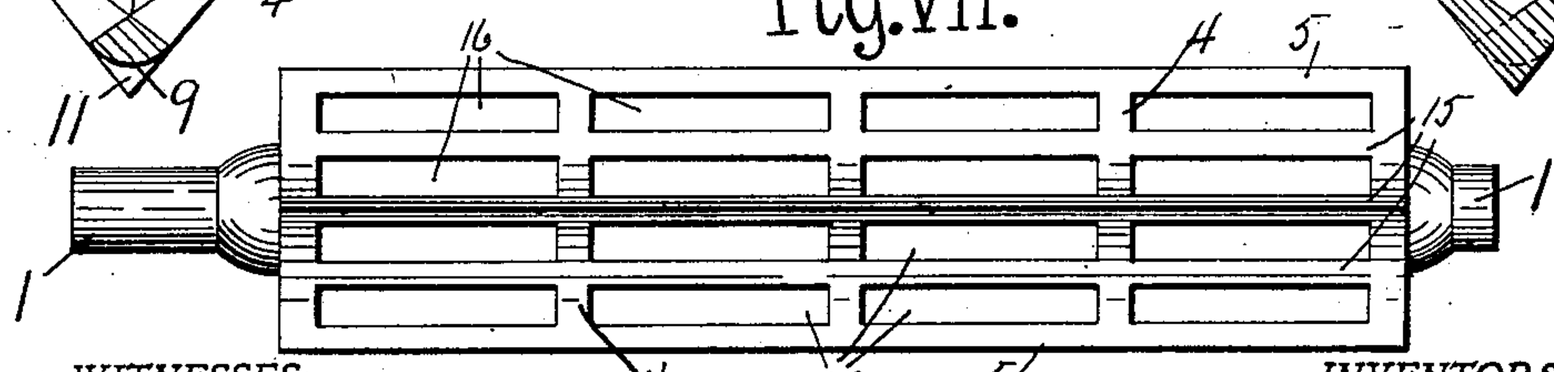


Fig. VII.



WITNESSES:

C. B. Schoneck

M. B. Smith

INVENTORS:

Francis Kernan

Joseph F. Kernan

BY

Alfred Wilkinson

ATTORNEY.

No. 730,772. PATENTED JUNE 9, 1903.

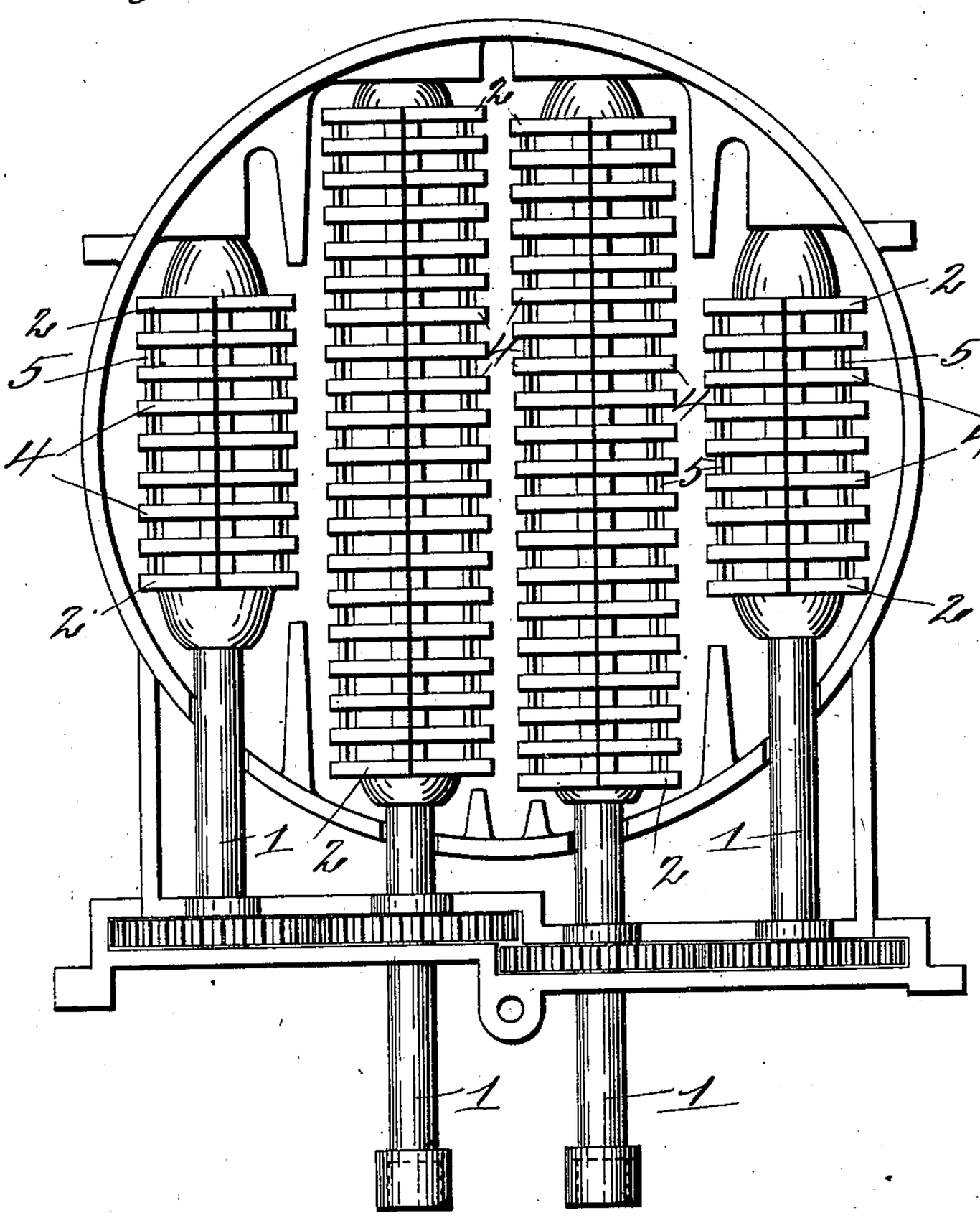
F. & J. F. KERNAN.

GRATE BAR.

APPLICATION FILED SEPT. 3, 1902.

NO MODEL. 2 SHEETS—SHEET 2.

Fig. VIII.



WITNESSES:

C. C. Schoneck.

M. E. Gagon.

INVENTORS:

Francis Kernan

Joseph F. Kernan

BY

Alfred Wilkinson

ATTORNEY.

No. 730,772. Patented June 9, 1903.

UNITED STATES PATENT OFFICE.

FRANCIS KERNAN, OF UTICA, AND JOSEPH F. KERNAN, OF NEW YORK, N. Y.

GRATE-BAR.

SPECIFICATION forming part of Letters Patent No. 730,772, dated June 9, 1903.

Application filed September 3, 1902. Serial No. 122,003. (No model.)

To all whom it may concern:

Be it known that we, FRANCIS KERNAN, residing at 58 Elizabeth street, Utica, Oneida county, and JOSEPH F. KERNAN, residing at 261 Central Park west, in the city and county of New York, State of New York, citizens of the United States, have invented certain new and useful Improvements in Grate-Bars; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Our invention relates to grate-bars of the rockable and hollow or skeleton type; and it consists, preferably, of an integral shell, substantially triangular in cross-section, formed of a series of transverse fuel-supporting ribs spaced apart and connected together by longitudinal webs.

The invention further consists in providing the fuel-supporting ribs with convex or truss-shape surfaces whereby a greater area of fuel-supporting surface is obtained and also a "slope" in opposite directions to insure a continuous dropping or sifting of the ashes through the grate between the bars.

The invention still further consists in the peculiar construction and novel arrangement of the transverse fuel-supporting ribs whereby a minimum amount of metal is employed and a maximum amount of air-space obtained without impairing the strength or durability of the bar.

In the construction of grate-bars of the shell or skeleton type it is highly important in order to promote perfect combustion that the greatest possible amount of air-space shall be obtained. Various attempts have been made to accomplish this object without impairing the usefulness of the bar, but without success; and one of the principal objects of this invention is to so construct a grate-bar that it will contain the greatest possible amount of space for the admission and supply of air to the fuel-bed and the least quantity of metal consistent with strength and durability. In carrying out this object we have found that the triangular form affords the smallest number of sides that can inclose a central air-chamber with the least weight and also give a plurality of interchangeable fuel-supporting surfaces, with greater durability for the whole bar. This form permits the bars to be set with their edges or angles close together, so as to be freely rotated and have the ashes to drop or sift freely between them. By constructing the fuel-supporting ribs with convex or truss-shape surfaces an important advantage is obtained, as it not only increases their strength in proportion to their weight, but also allows the ribs to be decreased in size, and consequently an increase in air-space. Besides these advantages the convex or truss-shape surfaces provide a larger area of support for the fuel-bed and afford sloping sides to facilitate the shedding of the ashes, so that a practically-continuous sifting of the ashes between the grate-bars is maintained, and, further, this form of fuel-supporting surfaces is less liable to danger of burning out or warping than plane or concave surfaces.

In the drawings, Figure I is an isometric view of the preferred form of our improved grate-bar; Fig II, a top plan of the same; Fig. III, a longitudinal sectional view of an elongated bar, showing a central transverse strengthening-web; Figs. IV and V, cross-sections, respectively, on lines IV and V of Fig. II; Fig. VI, a longitudinal sectional view showing a variation in the arrangement of the teeth and ribs; Fig. VII, a top plan view showing a slight variation in the arrangement of the air-openings, and Fig. VIII is a plan view of a number of our bars assembled to form a grate.

In the several views the numeral 1 indicates the journals; 2, the solid heads, preferably of the modified triangular form shown; 4, the transverse ribs, which form, with the longitudinal webs 5, the three fuel-supporting surfaces. The fuel-supporting ribs 4 form air-spaces 7, communicating with a central longitudinal air-chamber 8, said air-spaces being of greater width than the transverse ribs 4. The air enters the chamber 8 through the spaces in two sides or surfaces of the bar, and being there superheated passes through the spaces in the third side into the fuel-bed, thus bringing a maximum quantity of air into intimate contact with the fuel, effecting practically perfect combustion. The webs 5 have their outer corner edges prefer-

ably rounded, as shown at 9, to facilitate the shedding of the ashes and at the same time form the angular edges of the ribs into teeth 11 to crush the clinkers when the bars are rotated.

The transverse ribs may be made lighter and thinner at their centers, as shown in Figs. IV and V, without affecting the strength and durability of the ribs, and thereby produce a hexagonal form of air-chamber.

While the air-chamber is preferably continuous, giving a large inner opening from end to end, with a free circulation of air, yet extra-long bars may be strengthened by a transverse web 13, as shown in Fig. III, without materially interfering with the circulation of air.

In Fig. VI a very simple modification is shown, the teeth 11 being arranged in staggered form and some of the transverse ribs being arranged opposite air-spaces, so that in forming a grate the teeth of one bar will register and alternate with the teeth of the adjacent bars. The transverse ribs may be made much lighter by reducing a portion of their width, so as to form the ribs T shape in cross-section, as shown.

In the modified form of bar shown in Fig. VII the transverse fuel-supporting ribs are shown spaced farther apart, and longitudinal webs 15, in addition to the webs 5, are employed to give to the bar the requisite strength. This arrangement provides longitudinal spaces 16 for the supply of air instead of the transverse spaces 7, as shown in the other figures.

Other forms of the bar in cross-section may be made without departing from the spirit of our invention or sacrificing the principle thereof so long as the fuel-supporting surfaces are substantially convex; but the triangular form is preferred.

A grate-bar constructed in accordance with our invention meets and overcomes the various objections found in this class of bars heretofore constructed and has proved popular and successful in practical operation. The reduction in metal cheapens the cost of construction, the peculiar shape and novel arrangement of the transverse ribs and connecting-webs increases its strength and durability, and the increased amount of air-space, whereby an abundant supply of air is admitted to the fuel-bed, promotes more perfect combustion, practically without clinkers, with a greater efficiency of the fuel, and consequently an increase in the heating capacity of the furnace or other heater. The form of the bar permits the air-space to be of greater width than the fuel-supporting ribs, thus making the total area of air-space in each fuel-supporting surface greater than the area of metallic parts—an important and new feature in the construction of this type of grate-bars.

In Fig. VIII the bars are shown assembled to form a grate. Any suitable form of frame may be employed to support the bars. In the present instance a circular frame *a*, provided with suitable bearings for the journals of the bars, is shown, and each outer bar is provided with a cog-wheel *b*, which meshes with a similar cog-wheel *c*, secured on the adjacent central bar. The two central or intermediate bars have their outer ends extended and provided with heads *d*, adapted to receive a suitable shaking implement by means of which each set of bars may be revolved to shake the grate.

In practice a grate composed of a series of bars constructed after our invention requires but little shaking, as practically complete combustion is obtained with a minimum amount of fine ash and no clinkers.

Having thus fully described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In a grate, a series of revoluble bars having three fuel-supporting surfaces, each bar substantially triangular in shape and comprising a series of transverse ribs, spaced from one another, and a series of longitudinal webs, the portions of said ribs between the webs being substantially convex on their outer surfaces, as and for the purposes set forth.

2. In a grate, a series of revoluble bars having three fuel-supporting surfaces, each bar substantially triangular in shape and comprising a series of transverse ribs, spaced from one another, and a series of longitudinal webs, the portions of said ribs between the webs being substantially convex on their outer surfaces, and concave on their inner surfaces, as and for the purposes set forth.

3. In a grate, a series of revoluble bars having three fuel-supporting surfaces, each bar substantially triangular in shape and comprising a series of transverse ribs, spaced from one another, a series of longitudinal webs, the portions of said ribs between the webs being substantially convex on their outer surfaces, and solid end heads provided with journal-arms.

4. In a grate, a series of revoluble bars having three fuel-supporting surfaces, each bar substantially triangular in shape and comprising a series of transverse ribs, spaced from one another, said ribs being provided with truss-shape outer surfaces, and a series of longitudinal webs having rounded corners, as and for the purposes specified.

5. In a grate, a series of revoluble bars having three fuel-supporting surfaces, each bar substantially triangular in shape and comprising a series of transverse ribs, spaced from one another, said ribs being provided with truss-shape outer surfaces and correspondingly-shaped inner surfaces, and a series of longitudinal webs having rounded outer corners, as and for the purposes specified.

6. In a grate, a series of revoluble bars having three fuel-supporting surfaces, each bar substantially triangular in shape and comprising a series of transverse ribs, spaced from one another, said ribs being provided with

truss-shape outer surfaces, and a series of longitudinal webs, said webs having their outer corners rounded so as to form the angles of the transverse ribs into clinker-crushing teeth.

7. In a grate, a series of revoluble bars having three fuel-supporting surfaces, each bar substantially triangular in shape and comprising a series of transverse ribs, spaced from one another, said ribs being provided with truss-shape outer surfaces and correspondingly-shaped inner surfaces, a series of longitudinal webs, solid end heads provided with journal-arms, and a transverse strengthening-web.

In testimony whereof we affix our signatures in presence of two witnesses.

FRANCIS KERNAN.
JOSEPH F. KERNAN.

Witnesses:
C. C. SCHOENECK,
M. B. SMITH.