(No Model.) 2 Sheets—Sheet 1.

W. P. HARTHAN.

SHAKING GRATE.

No. 389,220. Patented Sept. 11, 1888.

Fig. 1.

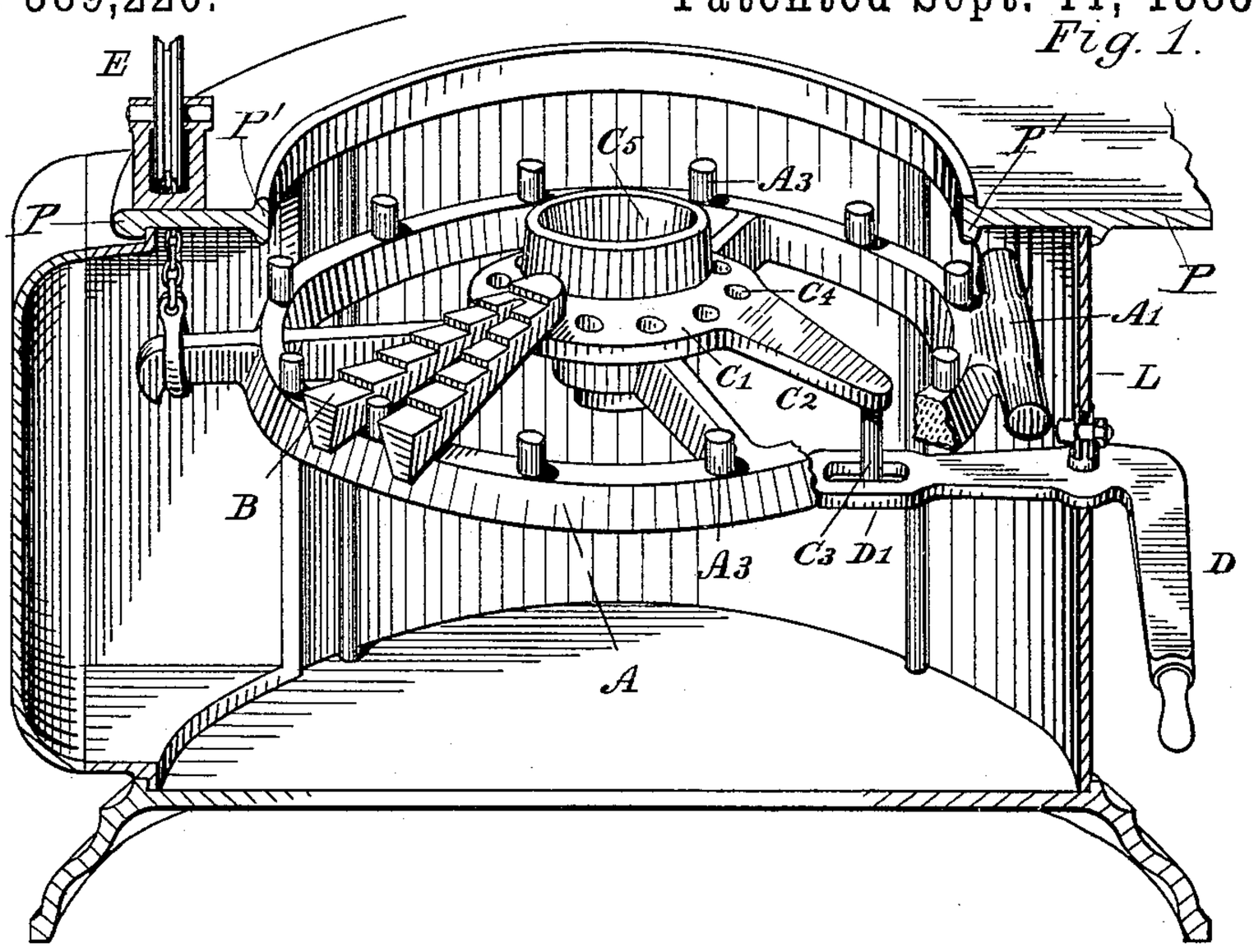
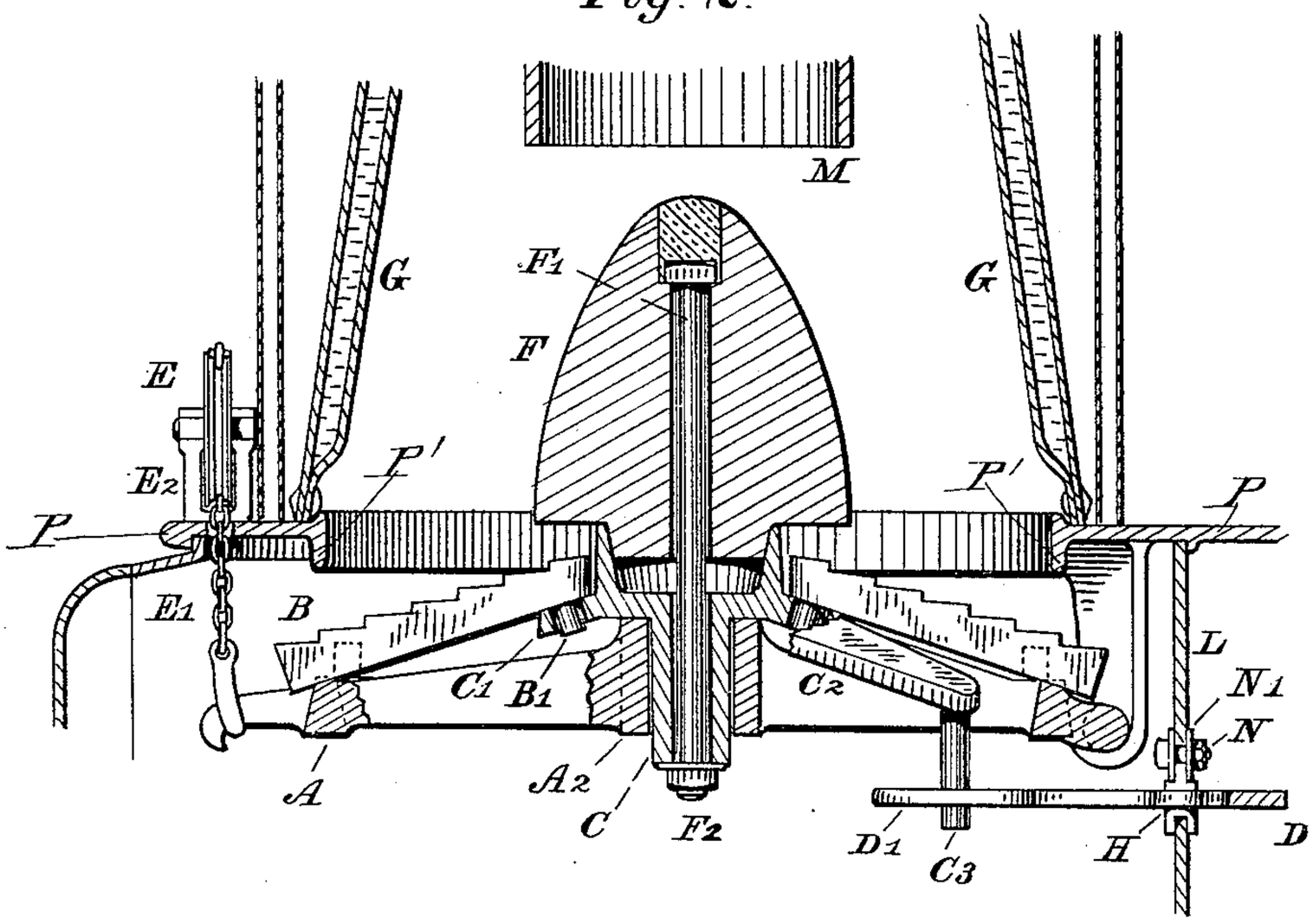


Fig. 2.



WITNESSES:

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INVENTOR,

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(No Model.) 2 Sheets—Sheet 2.

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SHAKING GRATE.

No. 389,220. Patented Sept. 11, 1888.

Fig. 3.

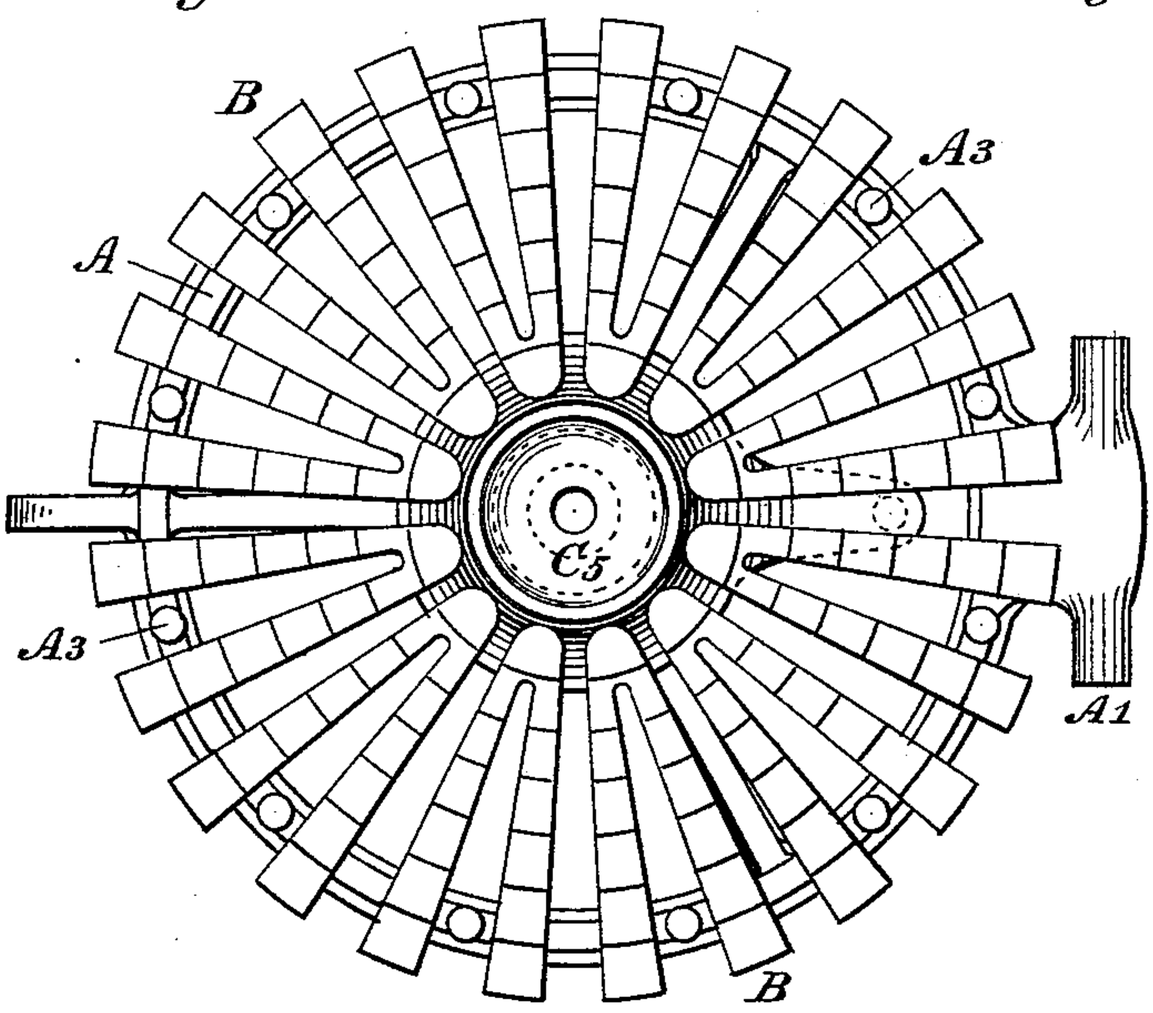
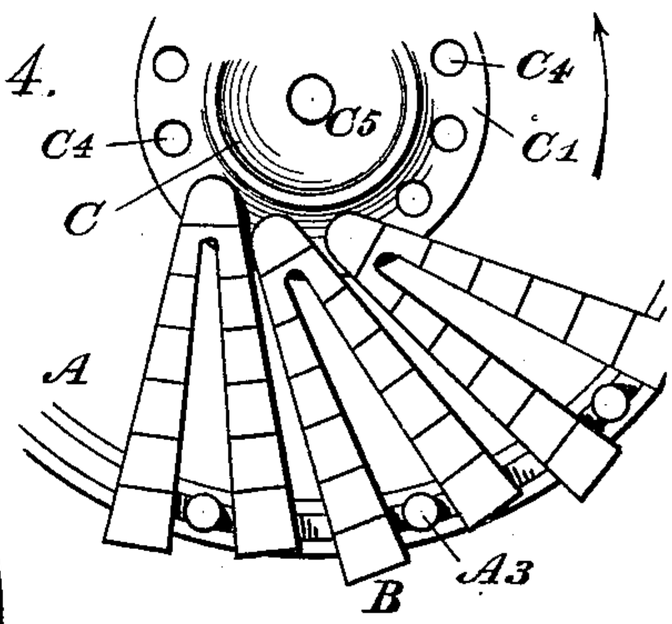


Fig. 4.



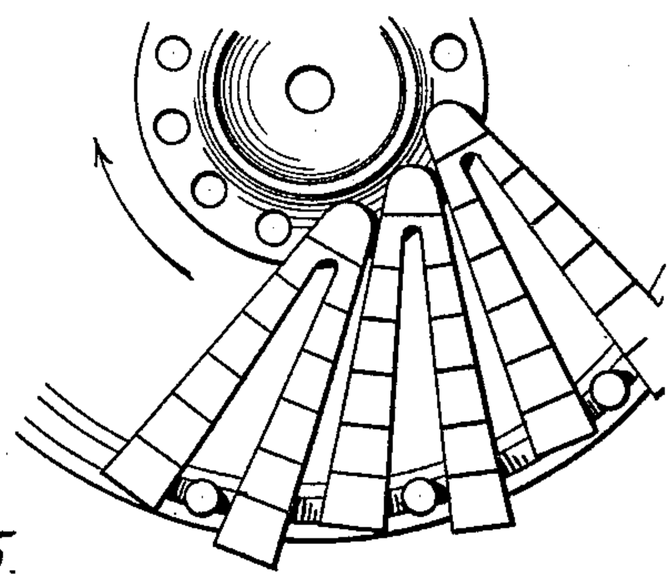


Fig. 5.

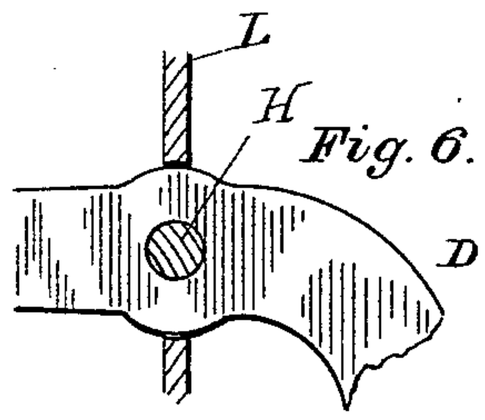


Fig. 6.

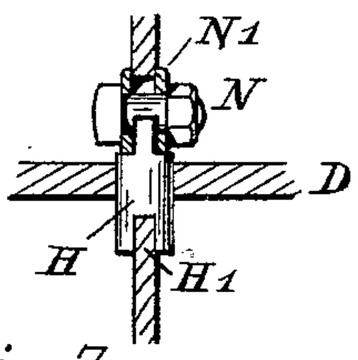


Fig. 7.

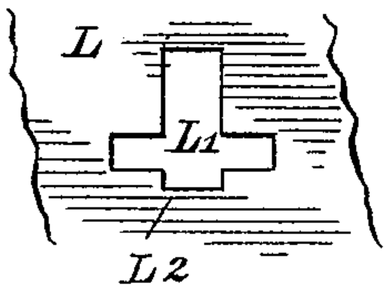


Fig. 8.

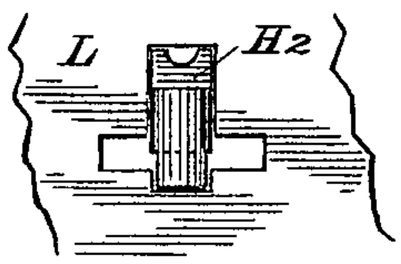


Fig. 9.

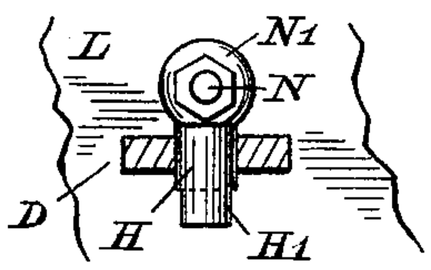


Fig. 10.

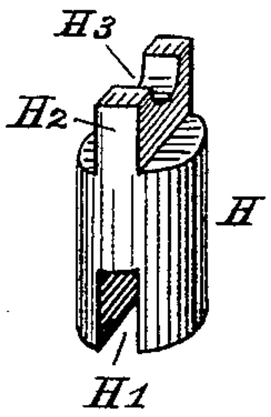


Fig. 11.

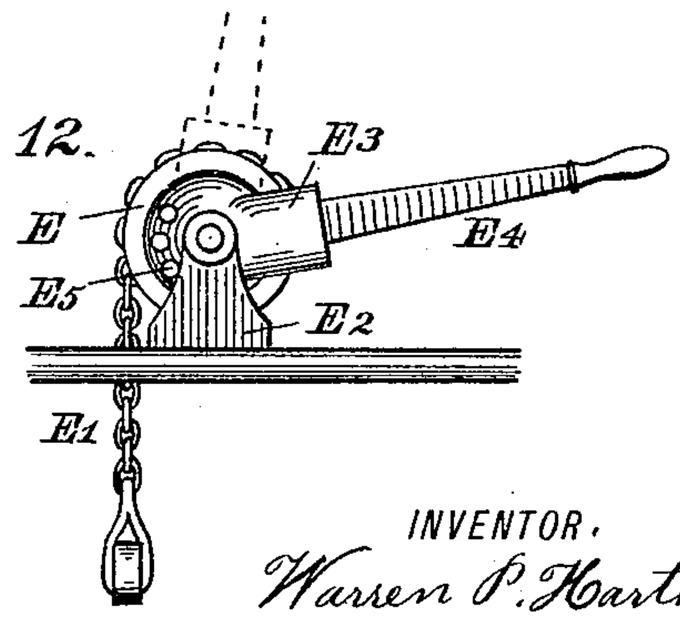


Fig. 12.

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UNITED STATES PATENT OFFICE.

WARREN P. HARTHAN, OF WORCESTER, MASSACHUSETTS.

SHAKING-GRATE.

SPECIFICATION forming part of Letters Patent No. 389,220, dated September 11, 1888.

Application filed June 11, 1886. Serial No. 204,883. (No model.)

To all whom it may concern:

Be it known that I, WARREN P. HARTHAN, a citizen of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented a new and useful Shaking-Grate, of which the following is a specification.

This invention relates to that well-known general class of grates in which independent bars supported upon a frame are adapted to receive a vibratory or oscillatory motion through connection with any suitable mechanism, by means of which motion the fire resting upon the bars is stirred and cleaned.

The invention is illustrated by the accompanying drawings, in which—

Figure 1 is a perspective view, in part section, showing one form of application of my improvement, the grate in this view having all the bars but one removed. Fig. 2 represents a central vertical section of the improved grate. Fig. 3 is a plan of the grate alone, all the bars being in place; and Figs. 4 and 5 are portions of Fig. 3, intended to illustrate the movement of the bars. Fig. 6 is plan, and Figs. 7, 8, 9, 10, and 11 are elevations showing in detail the pivoted joint of the shaking-lever; and Fig. 12 is an elevation of the dumping device, shown also in Figs. 1 and 2.

To best illustrate my invention I have chosen to show it as applied to a circular grate adapted to a magazine-feeding water-leg boiler for heating purposes, though the invention is equally applicable to grates of any shape and for any purpose.

Referring to Figs. 1, 2, and 3, A is a circular frame supported within an ash-pit by the hinge-trunnions A′ and the chain E′. The trunnions rest in the socket ends of brackets depending from the cast-iron base-plate in such manner that upon letting out the chain the frame A, turning on the hinge formed by the trunnions, is dropped in front, thus dumping the contents of the fire-pot in the usual manner. Forming a part of the frame A is a hub, A^2, which is cored out suitably to receive a center piece, C, fitting loosely therein and free to turn axially. This center piece has a flange, C′, adapted to support one end of the grate-bars B, and also forming a shoulder in contact with the hub A^2, whereby the weight of center piece, bars, and load upon them is sustained. From the flange of the center piece projects an arm, C^2, having a downwardly-projecting pin, C^3, adapted to engage with the slotted end D′ of the shaking-lever D, the motion of which is thus communicated to the center piece in the form of axial rotary oscillations.

The grate-bars B, which in this particular case are made double to better adapt them to the circular grate, rest upon the circular member of the frame A at their outer ends, being kept in their relative positions by the pins A^3, which are straddled by the fork of the bars. The inner ends of the bars rest upon the flange of the center piece, as aforesaid, and are held in position thereupon by the pins or studs B′, formed on the inner ends of the bars, the pins entering corresponding holes, C^4, in the flange and fitting loosely therein. The bars thus having a jointed connection with the center piece must partake of its movements when the shaking-lever is operated. The resulting motion of the bars may be understood by reference to Figs. 4 and 5, three bars only being shown as sufficient to illustrate the action of the whole. Fig. 4 represents the position of the bars at the extreme of oscillation in one direction, and Fig. 5 the opposite extreme, while Fig. 3 shows them in an intermediate position. Each bar receives a motion compounded of the circular oscillations of the inner end moving with the center piece, and the radial travel to and fro of the outer end, controlled by the pins A^3. This peculiar movement of the bars results in several practical advantages, which I will point out in detail. A comparison of the space between the bars, as in Fig. 3, and as in Figs. 4 and 5, will make it evident that this space is narrowed as the bars approach the positions in Figs. 4 and 5, and as these positions are approached there is an increase in leverage, so that the bars close with increasing force. It will also appear that the bars have a considerable longitudinal travel with reference to one another, and that the whole surface of the grate has a large range of movement as compared with its area, not only in a circular direction, but in a radial direction as well. The result is a most effective and rapid stirring up of the fuel on the grate, not attained in any form of shaking-grate known to me. The opening and closing of the space between the bars adds to the efficiency of the grate by its

action in breaking up the solid refuse of the fuel, clinker, stones, and whatever is not too large to drop partly between the bars, being easily crushed and dropped through the leverage as proportioned in practice, being ample to accomplish this result.

The compound motion of the grate-surface by which the fuel is not only moved back and forth circumferentially over a large proportionate distance, but is at the same time subjected to a violent shaking to and from the center, together with the nut-cracker action of the bars in opening and closing the space between them. These two features combined constitute the essence of my invention.

In the particular application of this grate which I have shown the clearing effect on the fire is increased by the construction seen to best advantage in Fig. 2, where the bars are arranged in the shape of a flat cone, and are made with serrated faces, the result being that such refuse as does not pass immediately through the grate when it is shaken is moved toward the periphery by the combined action of gravity and the radial motion of the bars, assisted by the direction of the saw-teeth on the face of the bars. All refuse which neither goes through between the bars nor is caught and crushed by the open-and-shut action is forced to the outer edge of the grate, and there, if it be too large to pass through the annular space between the surface of the grate and the ledge P′ of the base-casting P, (shown in Fig. 2,) it will be arrested by the ledge and forcibly acted on by the teeth on the bars moving radially back and forth, and at the same time circumferentially rolling, grinding, and rasping the resisting object until it is enough reduced in size to drop through into the ash-pit.

It will be noticed that as the bars move outward, approaching the intermediate position shown in Fig. 3, the leverage increases rapidly, a toggle being formed by the bar and the center piece, so that the outward thrust of the bar is practically irresistable with the leverage given to the shaking arrangement as usually made. The practical operation is that the most refractory clinkers and stones usually found in fuel are broken up and passed through this grate. So thorough and powerful is its action in clearing the fire and passing all refuse through into the ash-pit that a fire may be run continuously with less labor than has been the case heretofore, all use of the poker and need of dumping being done away with.

Referring to Figs. 1 and 2, the center piece, C, is surmounted by a cup, C^5, the purpose of which is to protect the broad surface of the flange from the action of the fire by means of the ashes, with which it remains filled. Further protection may be had by surmounting the center piece with a fire-clay cone, F, Fig. 2, which may be secured to the center piece by a through-bolt, as shown. The cone not only serves to protect the center piece and the ends of the grate, but it may act as a deflector to throw the fuel outwardly against the heating-surface when used with the type of boiler shown, increasing the heating economy by causing the fuel to be burned nearer the heating-surface, utilizing more radiant heat, and preventing that loss which results from more or less incomplete combustion of the central mass of fuel in a magazine-fed fire.

The third object of my invention is to so pivot the lever giving motion to the grate that there shall no aperture be left in the wall or casing of the ash-pit where the lever passes through, admitting air, when not wanted, and allowing ashes to escape when shaking the grate. As a necessity of usual constructions in this line, the pin upon which the lever pivots must be either upon one side or the other of the ash-pit wall in order to insert or withdraw the pin. Consequently the movement of the lever necessitates a slot in the wall considerably longer than the width of the lever, leaving the opening referred to. To avoid this I locate the pivot-pin within the thickness of the wall, and my invention provides a simple form of construction for this purpose, the result of such location and construction being that the lever may be operated in a slot practically no larger than the cross-section of the lever, therefore leaving no aperture. If the lever be enlarged, as shown in Fig. 6, it is obvious that the lever may completely fill the slot, making a perfectly dust and draft tight fit.

The pin is formed as shown in enlarged view, Fig. 11, and the aperture in the ash-pit wall as shown by Fig. 8. The lever with the pin in the hole is put in position, the pin being as in Fig. 9. Then the pin is dropped down to the position shown in Fig. 10, the forked end formed by the slot H′ straddling the thickness of the ash-pit wall, and the body of the pin fitting into that part of the aperture marked L^2. The lower end of the pin is thus secure against pressure in any direction, and it cannot be released except by lifting into the position in which it was inserted. To guard against this, the space in the aperture L′ left by the pin in dropping down is filled by a bolt, N, Figs. 7 and 10, which not only serves to keep the pin down, but secures the upper end of the pin in two directions, it being otherwise held by filling the aperture in the ash-pit wall. It is evident that the pin is thus immovably held, and that the moving of the lever does not open any aperture. The bolt N is shown with washers N′, which may be used to cover the aperture over the pin where the bolt might not fill.

The fourth object of the invention is attained by the means illustrated in Fig. 12 and also in Figs. 1 and 2. It consists, essentially, of a flexible connector between one side of a hinged grate and a drum upon which the connector may be wound, the drum having a handle for turning it and some means of securing it in any desired position. In the case shown the connector is a chain, E′, taking hold of a lug on the grate-frame, the other end of the chain being made fast to and wrap-

ping partly around the drum E. This drum turns on an axle supported in a frame, E^3, secured to the base-plate of the heater. A hand-lever, E^4, fitting a socket, E^3, formed on the side of the drum, affords a ready means of turning the drum through a limited arc, as shown by dotted lines. The drum is prevented from turning under the weight of the grate by thrusting a pin through one of the series of holes E^5, which pin comes to a bearing against the stand E^2. Without further description, it is evident that the grate can be raised and lowered by the hand-lever and sustained in any intermediate position for which a hole in the drum is provided. The advantages of this improvement are the extreme ease and convenience with which even the heaviest grates can be raised and lowered, and the facility with which one can be lowered to any degree for cleaning purposes when the fire is not to be extinguished.

Having thus described my invention, I claim—

1. A grate consisting of the frame A, a member, C, movable on said frame, a set of bars, B, pivoted in their inner ends to the member C and supported in their outer ends on the frame A, and a shaking-lever, D, connected to the member C, for actuating it and the bars B, all arranged and combined substantially in a manner and for the purpose as specified.

2. In a grate, the combination of frame A, provided with hub A^2, center piece, C, provided with perforated flange C′, grate-bars B, provided with studs B′, by means of which their inner ends are pivoted to flange C′, while their outer ends rest on frame A, and lever D, substantially as described.

3. In a grate, the combination of frame A, provided with hub A^2, center piece, C, provided with perforated flange C′, having the arm C^2 and pin C^3, grate-bars B, provided with studs B′, by means of which their inner ends are pivoted to flange C′, while their outer ends rest on frame A, and lever D, having the slot D′, substantially as described.

4. In a grate, the combination of frame A, provided with hub A^2 and guide pins or projections A^3, center piece, C, provided with perforated flange C′, grate-bars B, provided with studs B′, by means of which their inner ends are pivoted to flange C′, while their outer ends rest on frame A, and lever D, substantially as described.

5. The combination of member C, provided with cup C^5 at its upper end, cone F, and bolt F′, substantially as described.

6. In a grate, the combination of frame A, provided with hub A^2, center piece, C, provided with perforated flange C′, grate-bars B, provided with studs B′, by means of which their inner ends are pivoted to flange C′, while their outer ends rest on frame A, the annular ledge P′ on the base P, above the grate-bars, and the lever D, substantially as described.

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Witnesses:
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