(No Model.) 3 Sheets—Sheet 1.

A. J. MARSHBANK.

MECHANICAL STOKER.

No. 559,860. Patented May 12, 1896.

Fig. 1.

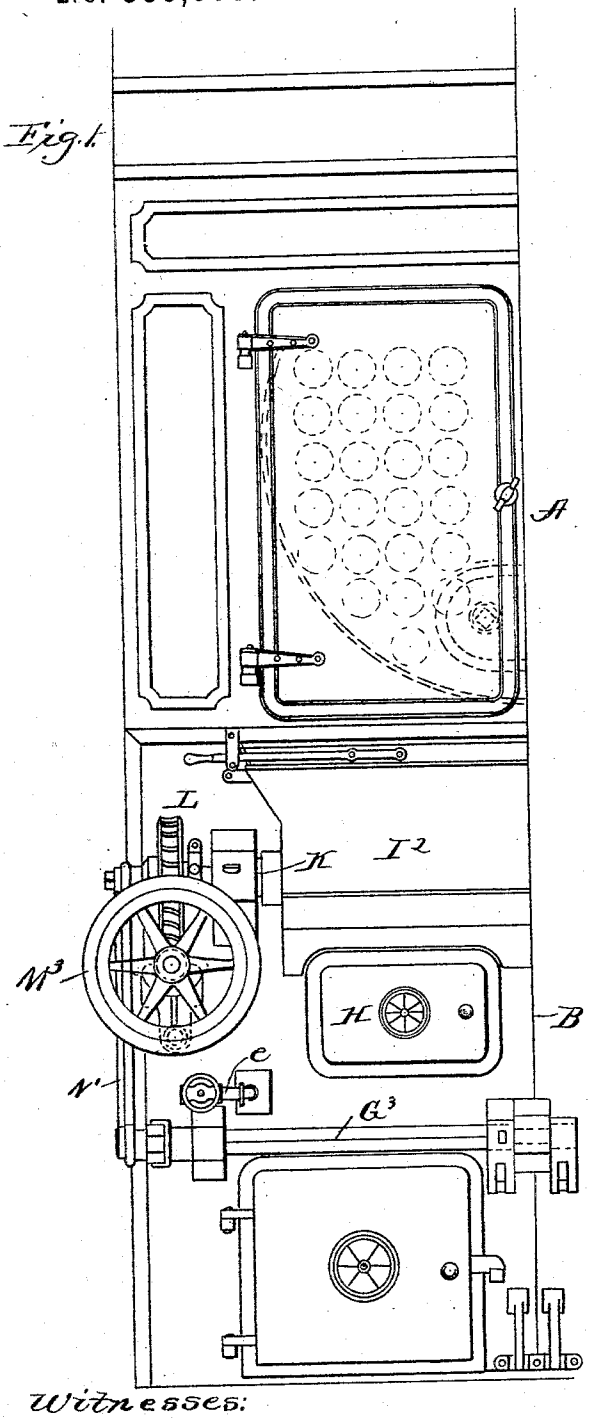


Fig. 6.

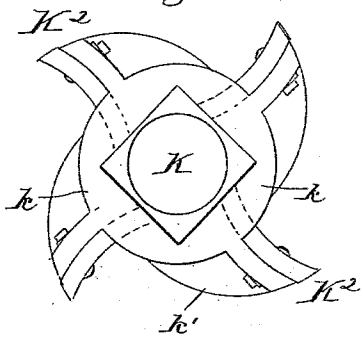
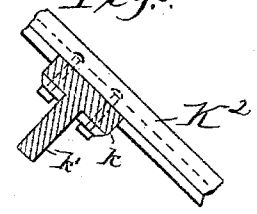


Fig. 6a.



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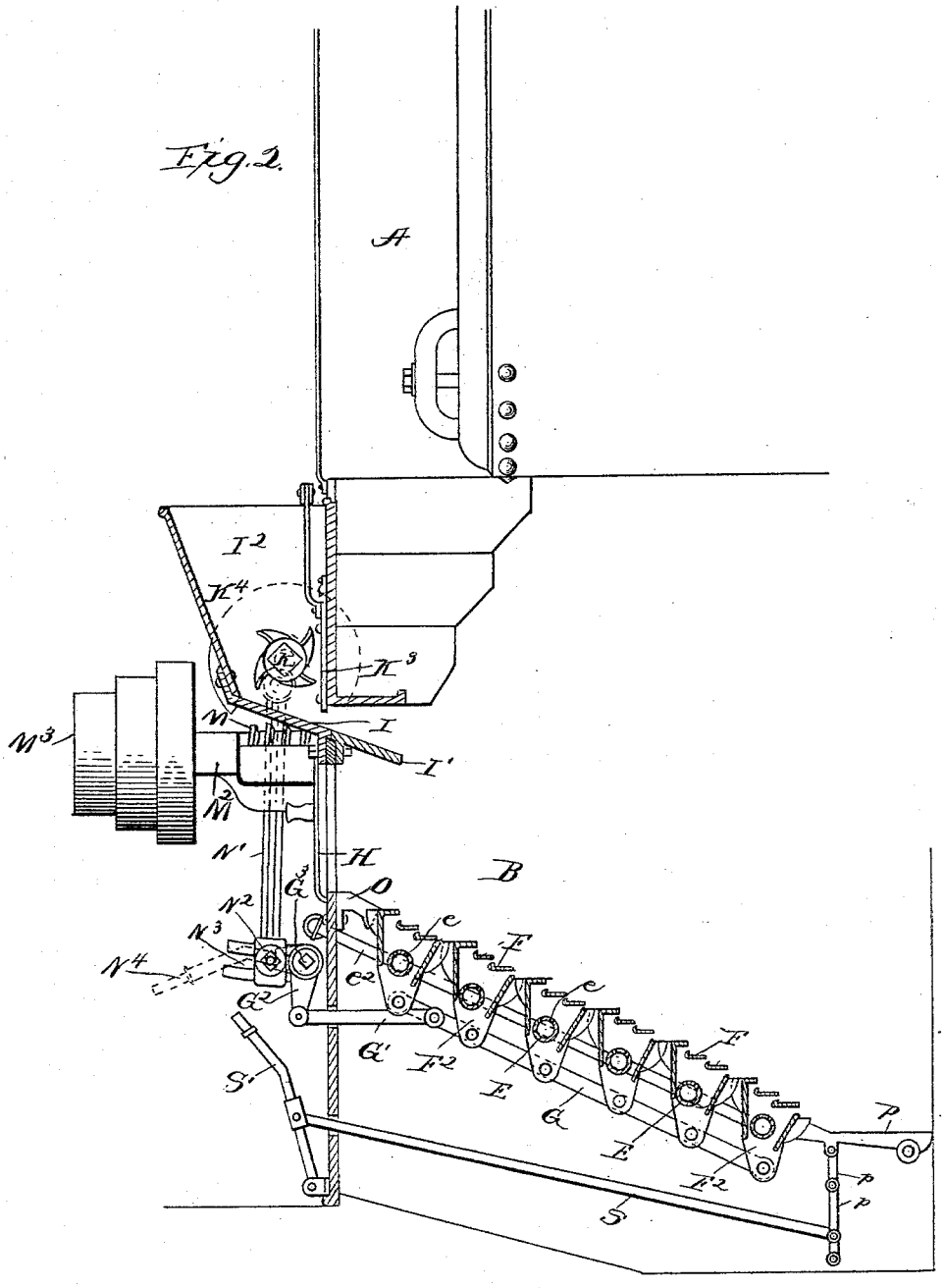
MECHANICAL STOKER.

No. 559,860. Patented May 12, 1896.

Fig. 2.



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(No Model.) 3 Sheets—Sheet 3.

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MECHANICAL STOKER.

No. 559,860. Patented May 12, 1896.

Fig. 3.

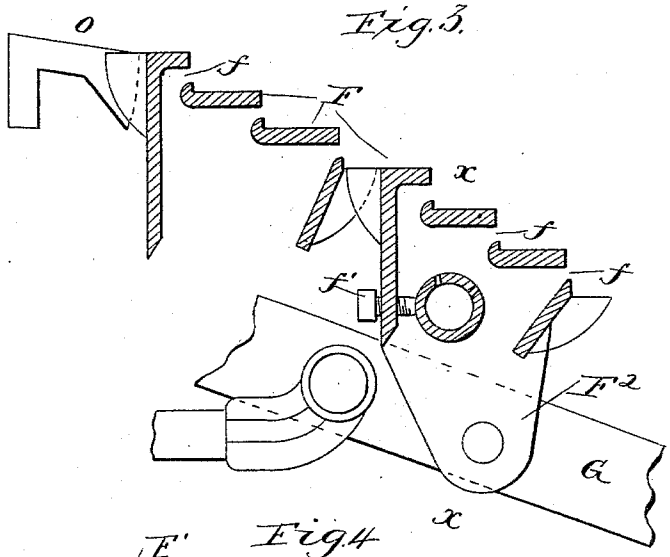


Fig 4

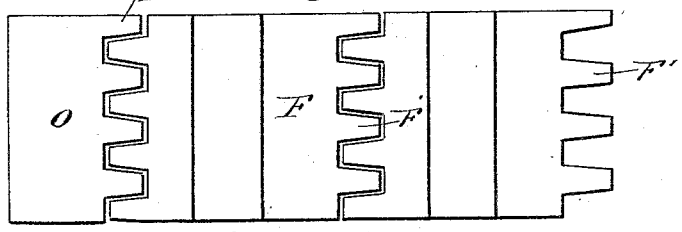


Fig. 5.

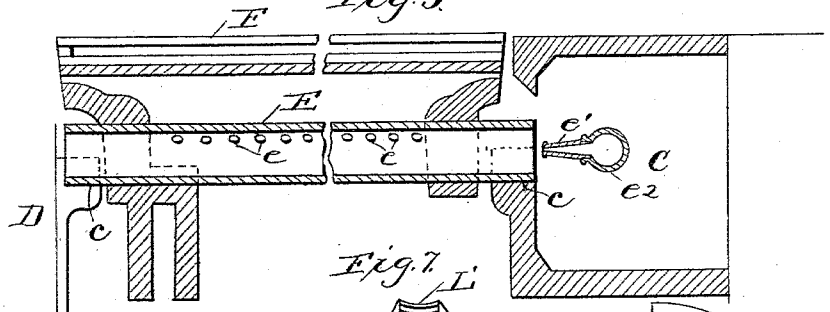


Fig. 7.

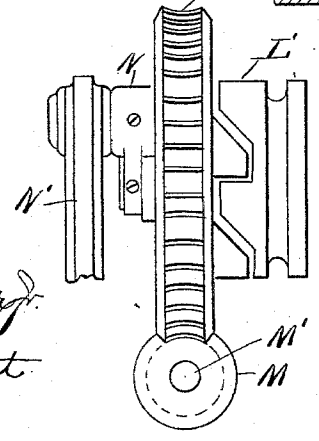
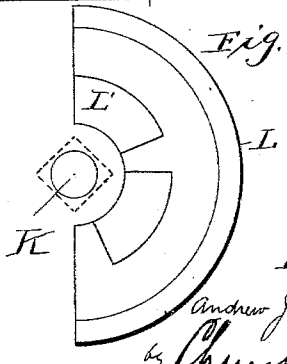


Fig. 7a



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UNITED STATES PATENT OFFICE.

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MECHANICAL STOKER.

SPECIFICATION forming part of Letters Patent No. 559,860, dated May 12, 1896.

Application filed November 4, 1895. Serial No. 567,900. (No model.)

To all whom it may concern:

Be it known that I, ANDREW J. MARSHBANK, of Lansdale, in the county of Montgomery and State of Pennsylvania, have invented certain new and useful Improvements in Mechanical Stokers; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the letters of reference marked thereon.

This invention relates to improvements in devices for feeding fuel to furnaces, &c., commonly known as "mechanical stokers," and has for its object to provide a simple and efficient mechanism for supplying the fuel evenly over a large grate area, and at the same time not only be capable of a perfect regulation for the automatic feeding of fuel, but also adapted for hand-feeding should it become desirable or necessary at any time.

The invention consists in certain novel details of construction and combinations and arrangements of parts, all as will be now described, and pointed out particularly in the appended claims.

Referring to the accompanying drawings, Figure 1 is a front elevation of one-half of a furnace equipped with a stoker embodying my present invention. Fig. 2 is a vertical sectional elevation of the same, taken in a plane from front to rear. Fig. 3 is an enlarged detail section of the grate. Fig. 4 is a top plan of the same. Fig. 5 is a vertical section on the line $x\,x$, Fig. 3. Figs. 6 and 6^a are details of the feed-roll. Figs. 7 and 7^a are details of the worm-gear feed and clutch on the feed-roll shaft.

Like letters of reference in the several figures indicate the same parts.

The letter A indicates the front of a boiler, which may be a single boiler or one of a battery, and B indicates the fire-box, located, as is usual, beneath the front end of the boiler, although so far as the present invention is concerned the manner of utilizing the heat or the location and arrangement of the fire-box are quite immaterial. Within the fire-box, inclining downward from front to rear, are bearing-bars, those at the sides (lettered C) being hollow, Fig. 5, and that at the center (lettered D) being solid, but having a deep bottom web to insure great strength, and all of said bearing-bars being provided with suitable bearings *c* for the ends of tubular grate-bar shafts E. The latter have openings *e* along their upper portions for the exit of steam or steam-charged air forced in by steam-jet nozzles *e'*, located in the side bearing-bars, directed into the ends of the grate-bar shafts and supplied with steam through pipes e^2, Fig. 2, leading from the boiler or other source of steam supply.

Upon each grate-bar shaft is mounted a grate-bar having its upper surface in the form of a series of relatively narrow steps F, with slot-openings *f* in the risers for the admission of air to the fire-bed. The grate-bars are located at different levels, forming an inclined fire-bed, and along each edge of the bars there is formed a series of teeth or projections F', which intermesh with the teeth or projections on the adjacent bars, as shown in Fig. 4, thus while any fine ashes may work through as the grate-bars are rocked back and forth no fuel can pass through. The bars are secured to their respective shafts by set-screws *f'*, and it will be noted that said shafts discharge up within the grate-bars, thus not only insuring a full supply of air for combustion, but at the same time keeping the bars from burning out or warping.

The rocker-bar G is connected to a downward extension F^2 of each grate-bar in any well-known manner, and at the forward end it is provided with a connecting-rod G', extending through the front of the ash-pit and connected to a crank-arm G^2 on a shaker-shaft G^3.

Above the upper end of the grate is an opening for hand-firing, normally closed, however, by a door H, and above this door is a second opening through which the fuel is automatically fed by the stoker. On the inside and at the bottom of this opening there is bolted an apron or feed-plate I, an outward prolongation of which, formed by the plate I', constitutes the bottom of the supply-hopper I^2, into which the fuel is dumped and from which it is fed by the feed-roll down the inclined feed-plate I onto the upper end of the grate.

The feed-roll is formed by a square shaft K, journaled in bearings at each end of the hopper and carrying a series of hubs k, each provided with wings k', constituting the supports for the feed-roll blades K^2, which are bolted thereto and preferably extend from end to end of the hopper. They are slightly curved in cross-section, as shown, and rotate immediately in front of the feed-opening, operating to draw fuel down and force it through said opening, as will be readily understood. To regulate the rate of feed, the size of the opening may be adjusted by means of the sliding gate K^3, and the feed is directed to the roll by the guide-plate K^4. On one end of the shaft K, outside of the hopper, I mount a worm gear-wheel L, preferably free to rotate, but connected with the shaft through the medium of a clutch L′, having a shifting-lever or other means for controlling it. A worm M on a shaft M′, supported in bearings M^2, is in mesh with the worm-gear L, and the power for driving the worm is transmitted from any suitable source through one or the other of the cone of pulleys M^3 on said shaft M′.

In addition to driving the feed-roll the worm gear-wheel L is adapted to drive the shaker-shaft, for which purpose it is provided with a crank N and connecting-rod N′, extending down and having a pin N^2 on the lower end adapted to enter an open slot-bearing in the crank-arm N^3 on the end of the shaker-shaft. By adjusting the pin in the slot-bearings the amplitude of movement imparted to the shaker-shaft and consequent extent of movement of the grate-bars may be varied at will, and by disconnecting said connecting-rod entirely the shaker-shaft may be operated by a hand-lever N^4. (Indicated in dotted lines, Fig. 2.)

Fuel is prevented from escaping into the ash-pit at the top of the grate by a stationary grate-section O, secured to the front wall of the fire-box and having a serrated or toothed front edge into which the teeth on the top grate-bar fit, (see Figs. 3 and 4,) and at the bottom of the grate the ashes, clinkers, and waste products are received on a substantially horizontal dumping-grate P, preferably pivoted at the rear end and supported at the forward end on toggle-links p p, to one of which the dumping-rod S is attached and extended out to the front of the ash-pit, where it is connected with the operating-lever S′. By the employment of toggle-links the three pivotal centers of the links may be brought into alinement to support the dumping-grate in horizontal position, and at the same time a powerful leverage is secured for moving the same.

In operation the fuel is dumped into the hopper and the pulleys M^3 bolted to any suitable source of power. The rotation of the said pulleys through the worm-gear connections rotates the feed-roll, giving a constant and even supply of fuel over the feed or dead plate down onto the upper portion of the grate. The rate of feed is governed by the speed at which the pulleys M^3 are driven and may be regulated in any well-known manner. Simultaneous with the feeding of the fuel the grate-sections are oscillated through the medium of the connecting-rod and cranks, as described, and should it be desirable at any time to operate the latter mechanism without operating the feed-roll it may be accomplished by simply throwing the clutch L′ out of engagement, disconnecting the shaft K from its drive-wheel. Fuel may then be supplied by hand through the opening immediately above the gate.

The employment of grate-bars, each made with steps and risers, it will be seen gives a uniform inclination to the fire-bed, enables me to employ a less number of bars and secure a perfect shaking action with less motion than heretofore.

In illustrating the invention I have not deemed it necessary to show but one half the grate as I prefer to make them, the other half being a duplicate, fed by the same feed-roll shaft and shaken through the medium of the same shaker-shaft, for which purpose an additional crank-arm Q is mounted on said shaft, as shown in Fig. 1, for the connection of the shaker-bar.

I claim—

1. In a mechanical stoker, the combination with the fuel-feeding mechanism, of the inclined grate formed by a series of oscillatory grate-bars, each grate-bar having its upper surface formed by a series of steps and risers; substantially as described.

2. In a mechanical stoker, the combination with the fuel-feeding mechanism of the inclined grate formed by a series of oscillatory grate-bars pivoted on centers located in an inclined plane, and each having its upper surface composed of a series of steps and risers with openings in the risers for the admission of air; substantially as described.

3. In a mechanical stoker, the combination with the fuel-feeding mechanism, of the inclined grate formed by a series of oscillatory grate-bars having their upper or bearing surfaces formed by a series of steps with intermediate risers provided with openings and each bar having each of its edges toothed, the top of said teeth forming a part of the fuel-supporting surface of the grate; substantially as described.

4. In a mechanical stoker, the combination with the fuel-feeding mechanism of the inclined grate formed by a series of oscillatory grate-bars having their upper or bearing surfaces formed by a series of steps with intermediate risers provided with openings, said bars being toothed along each edge and hollow grate-bar-supporting shafts located beneath said steps with air supply and exit openings in said shafts; substantially as described.

5. In a mechanical stoker, the combination with the fuel-feeding mechanism, of the inclined hollow bearing for the transverse per-

forated hollow shafts journaled in bearings therein, located at different levels, a steam-supply pipe having nozzles directed into said shafts, grate-bars mounted rigidly on said shafts and forming a series of steps for supporting the fuel; substantially as described.

6. In a mechanical stoker, the combination with the fuel-feeding mechanism, the inclined hollow side bearing-bar and central solid bearing-bar, of the perforated hollow shafts journaled in bearings in the bearing-bars, the grate-bars rigidly mounted on the shafts and each having its upper surface composed of a series of steps and risers having openings for the air-supply to the fire-bed and a steam-supply pipe in the hollow bearing-bar having nozzles directed into the shafts; substantially as described.

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