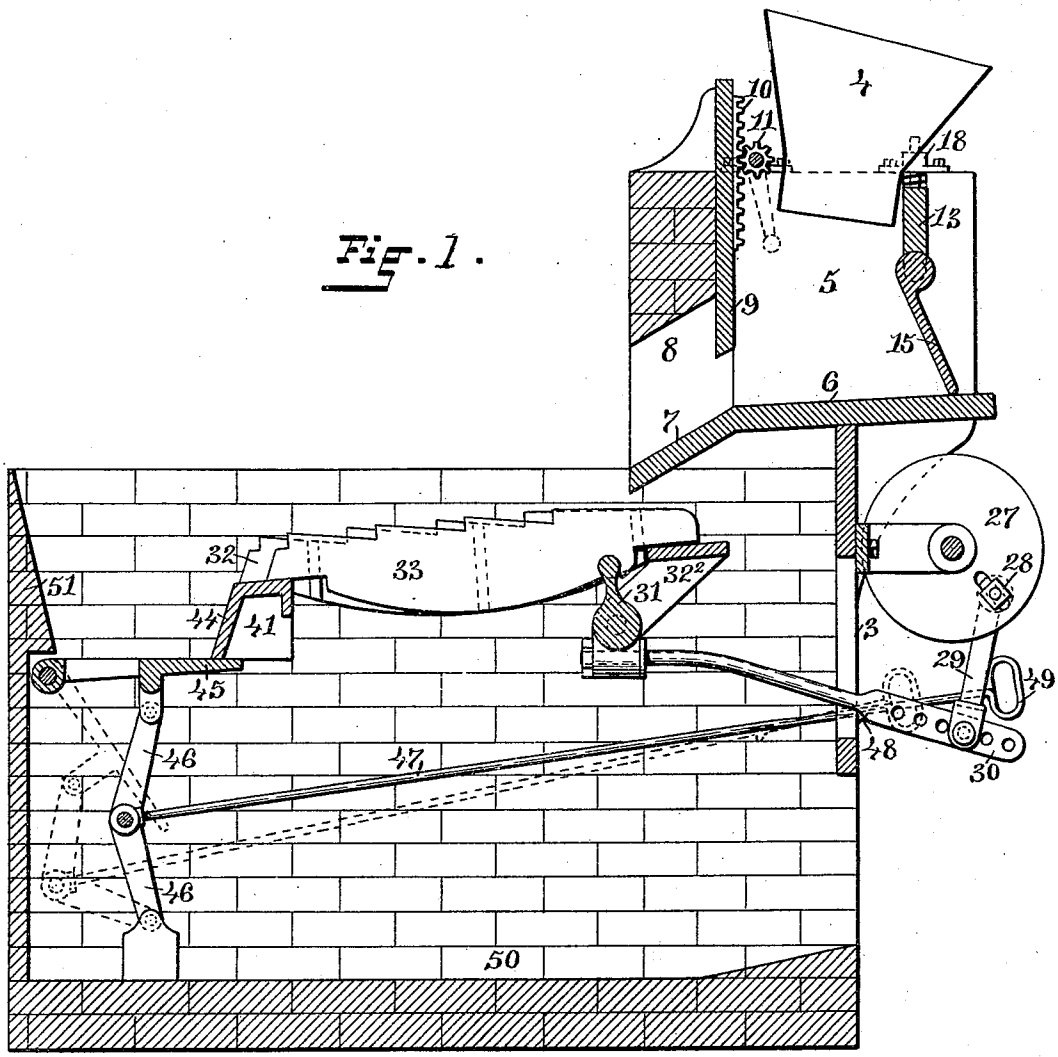
(No Model.) 3 Sheets—Sheet 1.

R. NEWTON.

MECHANICAL STOKER FURNACE.

No. 513,244. Patented Jan. 23, 1894.

Fig. 1.



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(No Model.)

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Fig. 2.

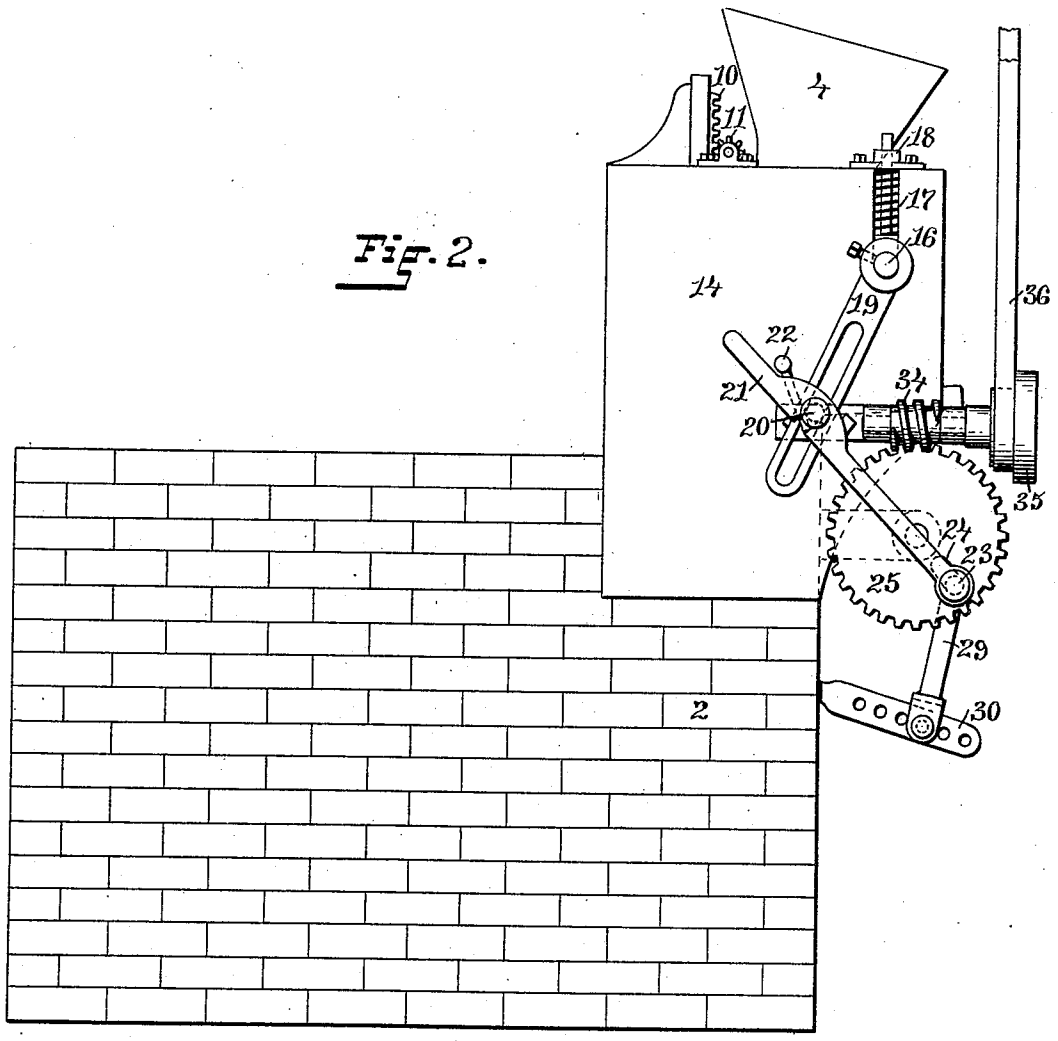

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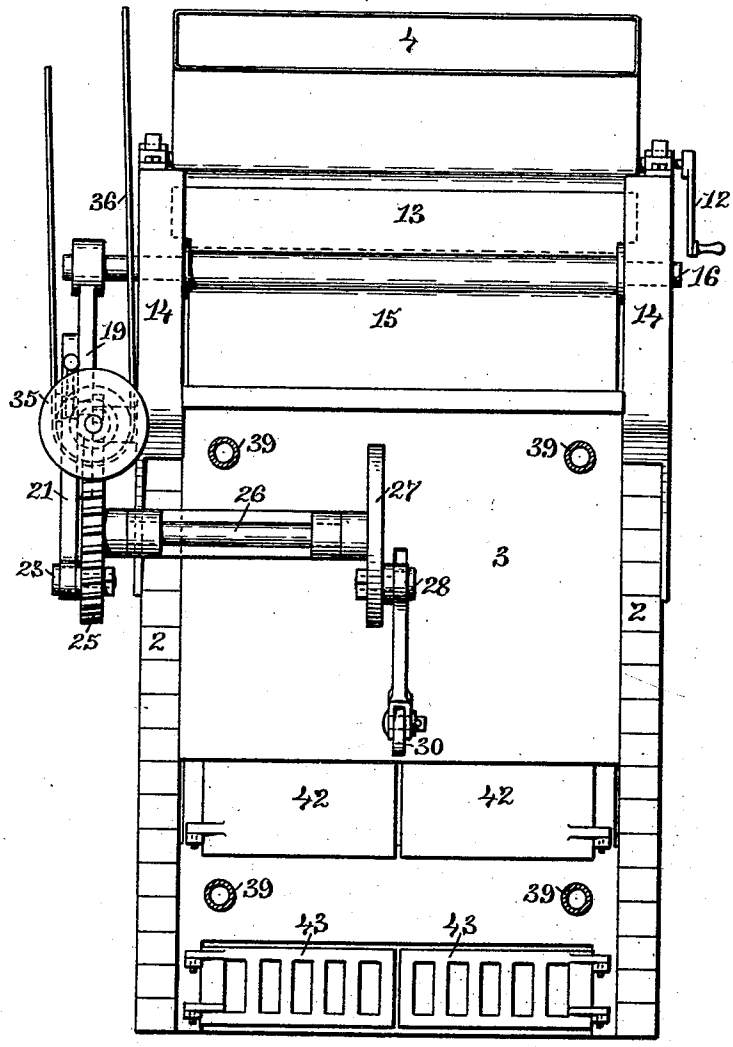
Fig. 3.



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UNITED STATES PATENT OFFICE.

ROBERT NEWTON, OF PROVIDENCE, RHODE ISLAND.

MECHANICAL-STOKER FURNACE.

SPECIFICATION forming part of Letters Patent No. 513,244, dated January 23, 1894.

Application filed March 19, 1891. Serial No. 385,579. (No model.)

To all whom it may concern:

Be it known that I, ROBERT NEWTON, of the city of Providence, in the county of Providence and State of Rhode Island, have invented a new and useful Improvement in Mechanical-Stoker Furnaces; and I hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification.

This invention has reference to furnaces in which the fuel is supplied by mechanical devices.

The invention is applicable to steam-generators and all other furnaces in which coal is burned.

In mechanical stokers, as heretofore constructed, the grates, on which the fuel is supported, are liable to warp and parts of the grates are liable to be melted and burned owing to the high temperature in the furnace and the exposed position of these parts. In such mechanical stokers the fuel is supplied to the furnace from an opening of less transverse width than the transverse width of the furnace and is therefore not evenly distributed over the surface of the grate; the sides of the grate being supplied with less fuel than the center, the draft of air through the sides of the grates is therefore greater than in the center.

In furnaces provided with mechanical stokers the fuel is supplied at the front end of the grate and is carried forward gradually to the bridge-wall end of the grate where the residue of the burned, or partially burned, fuel is delivered into a receptacle from which it is from time to time discharged; the heat at this bridge-wall end of the furnace is so great that the metal of the ends of the grates will burn or melt unless it is protected against this excessive heat.

The object of this invention is to so construct the furnace that the exposed parts of the grates shall be protected against injury, the fuel delivered evenly over the whole width of the grate, the interior of the furnace be readily accessible, the supply of fuel easily regulated as well as the forward movement of the fuel on the grate; and to these ends my invention consists in the peculiar and novel construction of the various parts, as will be more fully set forth hereinafter and pointed out in the claims.

Figure 1 is a vertical sectional view of a furnace provided with my improved mechanical stoker in which the ends of the grate-bars are protected by ashes. Fig. 2 is a side view of a furnace showing the mechanism for operating the mechanical stoker. Fig. 3 is a front elevation of a furnace provided with my improved mechanical stoker.

Corresponding numerals indicate corresponding parts in the drawings.

The numerals 2 indicate walls on each side of the furnace; 3 the iron front of the furnace. This front is shown as extending only across the upper part of the opening between the two side-walls 2. The lower part is usually closed and provided with a door through which the ash-pit can be reached.

4 is the hopper through which the fuel is supplied to the fuel-chamber 5, the plate 6 forming the bottom of the fuel-chamber.

7 is the dead-plate forming the inclined bottom of the stoke-hole 8.

The vertically-sliding gate 9 is provided near each end with a toothed-rack 10 and is operated by the pinions 11 secured to a transverse horizontal shaft and engaging with the rack 10. The shaft is provided at one end with the crank 12 by turning which the gate 9 may be raised or lowered and the opening from the fuel-chamber to the stoke-hole adjusted so as to regulate the thickness of the bed of fuel delivered to the furnace.

The front of the fuel-chamber 5 is formed by the slab 13 the ends of which enter vertical grooves formed on the inner sides of the end or cheek pieces 14. The lower edge of the slab 13 is concaved and rests on the upper rounded edge of the push-plate 15; this plate is firmly secured to the horizontal shaft 16 which shaft extends through the vertical slot in the end or cheek pieces 14. The spiral-springs 17, placed between a bolster resting on the shaft 16 and a bridge-piece 18 secured to the cheek-piece and extending across the slot, exert pressure on the shaft 16 sufficient to hold the lower edge of the push-plate 15 in contact with the plate 6 and yet, yield to the required rising of the shaft 16, as the push-plate 15 oscillates with the shaft to push the fuel into the furnace.

To the shaft 16 the slotted arm 19 is firmly secured and in the slot the wrist-pin 20 is adjustably secured. The lever 21 is passed over the wrist-pin 20 and is secured by the pin 22 extending diagonally under the wrist-pin. The pin 22 can be readily withdrawn and the lever 21 can then be raised off from the wrist-pin 20. The opposite end of the arm 21 is connected by the stud-pin 23 with the worm-gear 25, the stud-pin 23 being provided with a threaded shank extending through the radial-slot 24 in the worm-gear 25 and is secured therein adjustably by a nut, as is shown in Fig. 3. The worm-gear 25 is secured to one end of the horizontal shaft 26, which shaft is journaled in suitable bearings, and on the opposite end of the shaft 26 the disk 27 is secured, so as to rotate with the shaft. The stud-pin 28 is adjustably secured to the disk 27, a radial slot being formed in the disk to permit the adjustment of the stud-pin 28 nearer to or farther from the center of the disk 27. The link 29 connects the stud-pin 28 with the lever 30, the end of which lever being provided with a number of holes by any one of which the link 29 may be connected with the lever 30. The lever 30 is connected to the rocker 31 which extends transversely under the grate, the ends being journaled in the side-frames 32^2.

The grate is formed of the stationary grate-bars 32, and the reciprocating grate-bars 33 placed between the fixed grate bars or tubes, and these reciprocating grate-bars 33 are provided with a notch into which the upper part of the rocker 31 enters, so that when the rocker is oscillated on its end-bearings the grate-bars 33 will be moved forward and backward and will be slightly raised and lowered during these movements. The upper edges of the grate-bars are formed into saw-tooth-shaped projecting angles having one short vertical and one longer approximately horizontal side. Motion is imparted to this mechanism by means of the worm-shaft supported in suitable bearings and engaging with the worm-gear 25. The worm-shaft 34 is provided with one or more pulleys 35 connected by the belt 36 with an over-head driving-shaft. The driving-shaft is not shown. It may be arranged in the usual manner, or it may be a counter-shaft driven from the main-shaft.

The operation of this mechanism, when properly adjusted, controls the supply of the fuel and the combustion of the same in the furnace. The motion transmitted by the belt 36 to the worm-shaft 34 turns the worm-gear 25 and with the same the disk 27. The rotary motion of the worm-gear 25 is changed into the reciprocating motion of the lever 21 and, as this lever is connected with the slotted-arm 19 by the stud-pin 20, the reciprocating motion of the lever 21 is transmitted and changed into the oscillating motion of the arm 19 and the pusher-plate 15. The fuel delivered through the funnel 4 to the fuel-chamber 5 is pushed, by the forward motion of the lower part of the pusher plate 15, through the opening controlled by the gate 9 into the stoke-hole and over the inclined dead-plate 7 onto the grate. By the adjustment of the stud-pins 23 and 20, either or both, the extent of, or sweep of, the oscillating pusher-plate 15 can be regulated and thereby the fuel pushed into the furnace regulated, while the gate 9 regulates the thickness of the bed of coal. The weight of the slab 13, which rests on the pusher-plate 15, and also the pressure of the springs 17 hold the lower edge of the pusher-plate 15 in close contact with the bed-plate 6 and also permit the shaft 16 to rise as the pusher-plate approaches the perpendicular position. During the outward swing of the pusher-plate 15 the fuel descends by gravity, so that the fuel-chamber 5 is at all times filled with fuel and it requires to be so filled at all times, at least to the upper edge of the pusher-plate, to insure the delivery of the required quantity. The fuel so delivered on the grate is pushed forward by the reciprocating motion and the rising of the reciprocating grates 33 to which motion is transmitted, from the worm-gear 25, the shaft 26, and disk 27, by the link 29 connecting the disk with the lever 30, which imparts oscillating motion to the rocker 31. The extent of this reciprocation of the grate-bars 33 can be regulated by the adjustment of the wrist-pin 28 and the connection of the link 29 with the lever 30.

While the stoker and the mechanism for operating the same are applicable to any kind, or form, of furnace and may be used in connection with any kind of grate on which the fuel is carried forward mechanically, or by gravity, the construction of the furnace proper is a most essential and important feature in a mechanical stoker in which the reciprocating grate-bars must be protected so as to retain their freedom to move the fuel forward from the dead-plate toward the bridge and thus maintain the continuity of the bed of fuel, and the burned, or partially burned, fuel must be delivered into a receptacle between the end of the grate and the bridge-wall 51 which is usually provided with a dumping-grate.

In Fig. 1 the supporting plate 41 is provided with the inclined side 44 wide enough to form the required pocket, and the hinged dumping-grate 45 is made solid at its forward end and is held against the bearing 41 by the toggle-jointed levers 46 drawn forward by the rod 47 provided with the hook 48 for securing the rod to the front 3 and at its end with the handle 49. By this construction the air is prevented from entering the fuel at the closed portion of the dumping-grate and the burned, or partially burned, fuel and ashes protect this portion of the furnace and the ends of the grate-bars, while the refuse can be readily dumped into the ash-pit.

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

1. In a mechanical stoker, in combination,

a grate adapted to move the fuel forward from the dead-plate, a fuel-chamber, or reservoir, having a fixed bottom or bed-plate, a pusher-plate, pivoted at its upper end in vertically yielding bearings, adapted to push the fuel out of the fuel-chamber, and a gate, provided at each end with a rack and pinion, adapted to regulate the thickness of the bed of fuel, as described.

2. The combination in a mechanically controlled furnace with the fixed and the reciprocating grate-bars, of the bearing-plate 41 provided with the inclined side 44, the dumping-grate 45 the forward portion of which is imperforate, the toggle-jointed levers 46, and the rod 47, as and for the purpose herein set forth.

3. In a mechanically fed and operated furnace, the combination with the hopper 4, the fuel-chamber 5, the stoke-hole 8, the dead-plate 7, the bed-plate 6 forming the bottom of the fuel-chamber, the push-plate 15 hinged at its upper end the lower end sweeping over the surface of the bed-plate, the arm 19 adapted to vibrate the push-plate to feed the fuel to the furnace, the reciprocating grate-bars 33, the rocker 31, and the mechanism, substantially as described, for operating the arm 19 and rocker 31, as and for the purpose described.

4. The combination with a grate adapted to move the fuel forward, the stoke-hole, and the dead-plate, of a fuel-chamber placed in front of the stoke-hole having a fixed bed-plate forming the bottom of the fuel-chamber, the pivoted push-plate 15 journaled in the vertical slots in the ends of the fuel-chamber, the slab 13 and the springs 17 adapted to hold the lower edge of the push-plate in contact with the bed-plate, the arm 19, and mechanism for operating the push-plate to feed the fuel into the furnace, as described.

5. In a mechanical stoker, the combination with the stoke-hole, the vertically adjustable gate 9, and the fuel-chamber 5 having the fixed bed-plate 6, of the push-plate 15 hinged at its upper end, the shaft 16, the slotted-arm 19 secured to the shaft and provided with the adjustable wrist-pin 20, the arm 21, the worm-gear 25 provided with the adjustable wrist-pin 23, and the worm-shaft 34, provided with the pulley 35, adapted to operate the push-plate, as described.

6. The combination with the dead-plate 7, the vertically adjustable gate 9, the fuel-chamber 5 having the fixed bed-plate 6 forming the bottom of the fuel-chamber, the hinged push-plate 15, the shaft 16, the arm 19 secured to the shaft, the reciprocating grate-bars 33, and the pivoted-rocker 31, of the worm-shaft 34 adapted to be driven from a prime motor, the worm-gear 25 provided with an adjustable wrist-pin, the lever 21 connecting the worm-gear with the arm 19, the shaft 26, the disk 27 secured to the shaft and provided with the wrist-pin, the link 29, and lever 30, the whole adapted to feed the fuel to the furnace and move the same forward on the grate, as described.

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