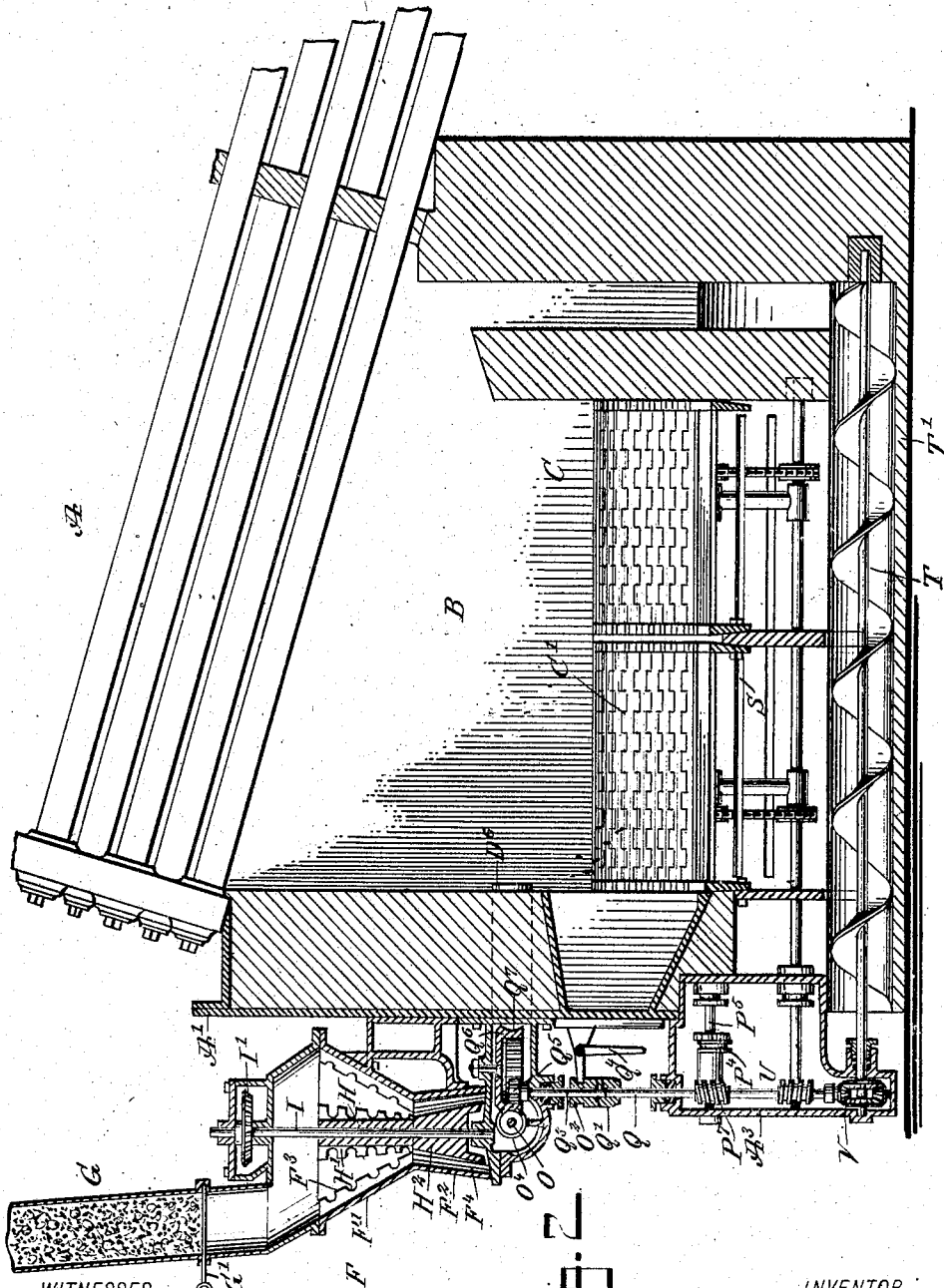


T. V. ELLIOTT.
MECHANICAL STOKER.
APPLICATION FILED MAR. 23, 1908.

942,060.

Patented Dec. 7, 1909.

4 SHEETS—SHEET 2.



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Fig. 2

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4 SHEETS—SHEET 3.

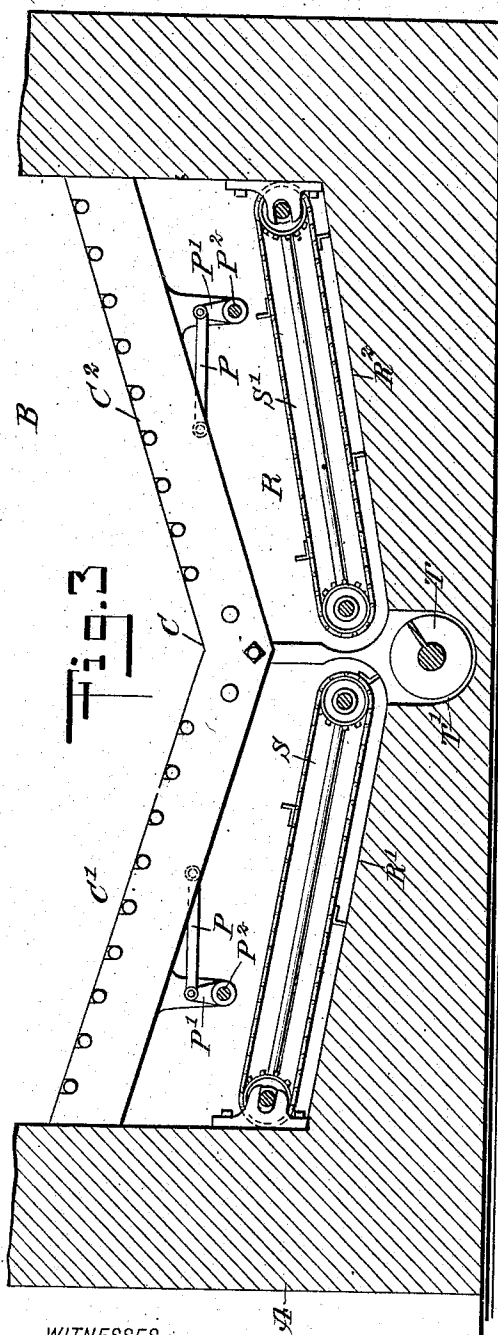


Fig. 3

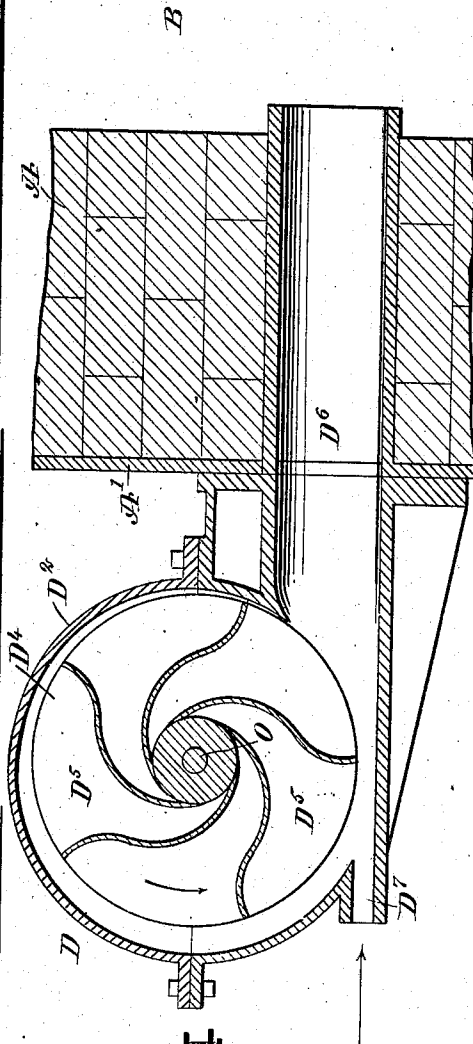


Fig. 4

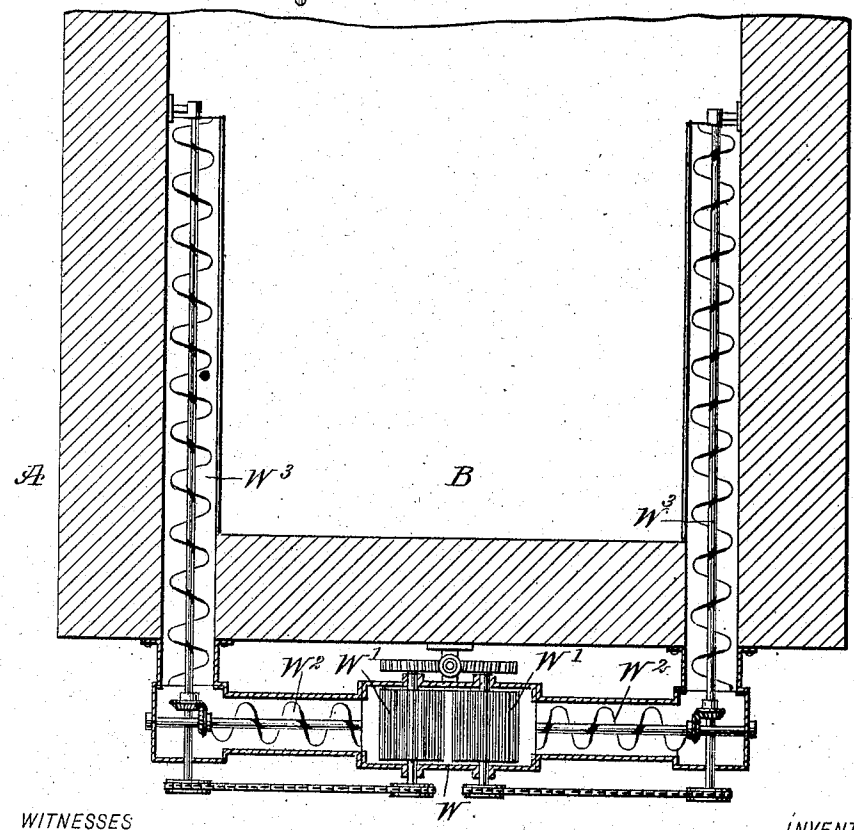
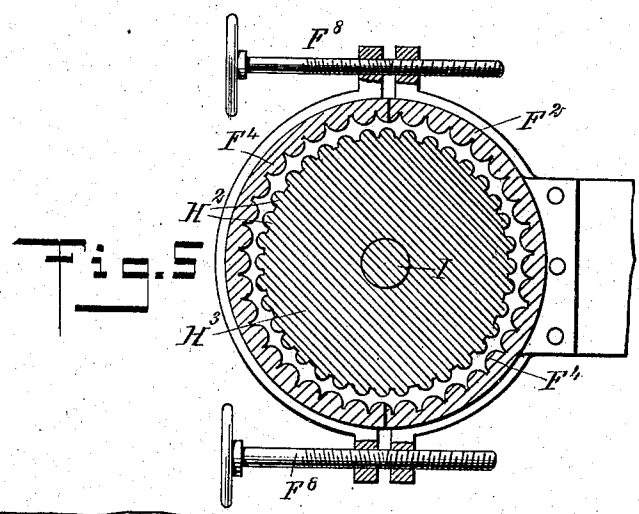
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4 SHEETS—SHEET 4.



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Fig. 6

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UNITED STATES PATENT OFFICE.

THADDIOUS V. ELLIOTT, OF NEW YORK, N. Y.

MECHANICAL STOKER.

942,060.

Specification of Letters Patent.

Patented Dec. 7, 1909.

Application filed March 23, 1908. Serial No. 422,664.

To all whom it may concern:

Be it known that I, THADDIOUS V. ELLIOTT, a citizen of the United States, and a resident of the city of New York, Flatbush, borough of Brooklyn, in the county of Kings and State of New York, have invented a new and Improved Mechanical Stoker, of which the following is a full, clear, and exact description.

The object of the invention is to provide a new and improved mechanical stoker, arranged to crush or reduce the coal to a fine mesh, to distribute the reduced coal uniformly over the grate surface in the fire box, to insure proper burning of the fuel and complete combustion thereof, to agitate the grate constantly and at a slow motion, with a view to keep the fire clean from dead ashes and to prevent coking, and to automatically remove the ashes from the furnace.

The invention consists of novel features and parts and combinations of the same, which will be more fully described hereinafter and then pointed out in the claims.

A practical embodiment of the invention is represented in the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a front elevation of the improvement, parts being in section; Fig. 2 is a reduced longitudinal central section of the same; Fig. 3 is a cross section of the fire box, grate and ash remover; Fig. 4 is an enlarged sectional side elevation of one of the centrifugal feed wheels for forcing the reduced fuel into the fire box; Fig. 5 is an enlarged central plan view of the crusher, and Fig. 6 is a sectional plan view of a modified form of the improvement.

The furnace A on which the improved stoker is applied, is provided in its fire box B with a grate C, made V-shape in cross section to provide inclined sides or sections C' and C² onto which the fuel, such as coal, in a reduced or divided state, is scattered by the force of revoluble centrifugal feed wheels D, D' held on the outside of the front A' of the furnace, the fuel being fed to the said feed wheels D, D' by endless conveyers E, E' into which discharges the lower end of a crusher F, employed for reducing ordinary lump coal to a desired fine state, the said lump coal being supplied to the crusher F from a suitable chute G, as indicated in

Fig. 2, the chute being provided with a suitable gate G' for controlling the amount of the lump coal passing into the upper end of the crusher F. The crusher F is provided with a casing having an upper section F' and a lower section F², both sections being made in frusto-conical shape, united at their apexes, as plainly indicated in Figs. 1 and 2. On the inside of the casing section F' are arranged notched crushing bars or ribs F³, and plain crushing ribs F⁴ are arranged on the inside of the lower casing section F². The ribs F³ in the upper casing section F' operate in conjunction with notched ribs H' of a crushing wheel H secured on a shaft I extending centrally in the casing of the crusher F. The ribs F⁴ operate in conjunction with ribs H² on a conical crushing wheel H² secured to the lower end of the shaft I and extending within the lower casing section F². The upper crushing wheel H is made cylindrical, and consequently lump coal fed into the upper end of the casing is gradually reduced and finally passes into the lower casing section F², in which it is reduced to a still finer state.

On the upper end of the crusher shaft I is secured a bevel gear wheel I' in mesh with a pinion J' secured on a horizontally-extending shaft J, carrying a clutch member J², under the control of the operator by the use of a shifting lever J³, the said clutch member J² being mounted to slide on and to rotate with the shaft J. The clutch member J² is normally in mesh with a clutch member K' held on the member K² of a friction drive K, having intermediate wheels K³ for connecting the member K² with a member K⁴, mounted to rotate loosely on the shaft J, the same as the member K². The wheels K³ of the friction drive K can be shifted into angular positions, to increase or decrease the speed transmitted by the member K⁴ to the member K². As this construction of the friction drive K is well known, further description of the same is not deemed necessary. On the upper end of the member K⁴ is secured a sprocket wheel L connected by a sprocket chain L' with a sprocket wheel L², fastened on a friction clutch member N' mounted to rotate loosely on the main driving shaft N, journaled in suitable bearings on the front A' of the furnace, the shaft N being connected with a suitable engine or other means for imparting a continuous ro-

tary motion to the shaft N. The clutch member N' is adapted to be engaged by a clutch member N², mounted to rotate with the shaft N, and under the control of the operator to permit the latter to throw the clutch member N² in or out of gear with the clutch member N', to rotate the clutch member N' and to impart a rotary motion by the sprocket wheels L², L and the sprocket chain L' to the friction drive K for rotating the shaft J whenever the clutch members J² and K' are in mesh. Now the rotary motion of the shaft J is transmitted by the pinion J' and the gear wheel I' to the crusher shaft I to rotate the crusher wheels H and H² for crushing the coal, as above explained.

The lower end of the lower casing section F² is provided with outlets F⁵, F⁶ extending sidewise and opening into the inner ends of the tubular casings E², E³ of the conveyers E and E'. In the casings E² and E³ are mounted endless conveyers E⁴, E⁵, secured on a shaft O, journaled in suitable bearings on the front A' of the furnace. One end of the shaft O is provided with a sprocket wheel O' connected by a sprocket chain O² with a sprocket wheel O³ secured on the clutch member N', so that when the latter is driven from the main shaft N by the clutch member N², as above described, then a rotary motion is transmitted to the shaft O by the sprocket wheels O³, O' and the sprocket chain O². Thus when the crusher F is in action the endless conveyers E and E' are also driven to feed the coal crushed in the crusher F to the centrifugal wheels D and D'. Each of the centrifugal wheels D and D' is provided with a cylindrical casing D² having at its inner side a central inlet D³ for the passage of the coal from the tubular casings E² or E³ into the casing D² and into fuel conduits D⁵ formed in a wheel D⁴ secured to the shaft O and rotating within the casing D². Each of the fuel conduits D⁵ has its inlet in register with the corresponding casing inlet D³, and the outlet of each fuel conduit D⁵ is at the periphery of the wheel, so that the divided coal is discharged from the fuel conduit peripherally and into an outlet D⁶ leading from the casing D² and extending through the front wall of the furnace A into the fire box B, as plainly shown in Figs. 2 and 4. As the wheels D⁴ are secured on the shaft O, it is evident that they rotate in unison with the endless conveyers E and E' and the crusher F, and consequently the coal crushed in the crusher F is equally distributed or fed to the endless conveyers E, E', which deliver the reduced coal to the wheels D⁴, which in turn force the reduced coal through the outlets D⁶ into the fire box B for the coal to fall onto the sections C' and C² of the grate C.

The grate C is preferably of the construction more fully shown and described in the

application for Letters Patent of the United States, for a stoker, No. 235,942, filed by me on December 8, 1904, and hence further detail description of the grate C is not deemed necessary, it being sufficient to state that each of the grate sections C', C² is provided with rocking, perforated grate bars extending lengthwise of the fire box B, the grate bars in each section C', C² being connected with each other by connecting bars, which in turn are connected by links P (see Fig. 3) with arms P' on longitudinally-extending shafts P² journaled in suitable bearings arranged in the lower portion of the fire box B. The shafts P² extend through the front A' of the furnace into a casing A³, and on the outer ends of the shafts P² are secured arms P³ connected with eccentrics P⁴ held on longitudinal shafts P⁵ journaled in the casing A³. On the shafts P⁵ are secured worm wheels P⁶ in mesh with a worm P⁷ secured on a vertically-disposed shaft Q journaled in suitable bearings arranged on the casing A³. The shaft Q extends through the top of the casing A³ and on its upper outer end is secured a clutch member Q' adapted to be engaged by a clutch member Q² mounted to slide on and to turn with a shaft Q³ journaled in the lower portion F⁷ of the casing for the crusher F. The clutch member Q² is engaged by a shifting lever Q⁴ under the control of the operator, for throwing the clutch members Q' and Q² out of mesh with each other whenever it is desired to stop the rocking of the grate bars. The upper end of the shaft Q³ is provided with a pinion Q⁵ (see Fig. 2), in mesh with an internal gear wheel Q⁶ formed on a worm wheel Q⁷ in mesh with a worm O⁴ secured on the shaft O, as shown in Figs. 1 and 2. Now when the shaft O is rotated, as previously explained, then a slow rotary motion is given by the worm O⁴ to the worm wheel Q⁷, which by the internal gear wheel Q⁶ and the pinion Q⁵ rotates the shaft Q³, and the rotary motion of the latter is transmitted by the clutch members Q', Q² to the shaft Q, which rotates the shafts P⁵ by the use of the worm P⁷ and the worm wheels P⁶. When the shafts P⁵ are rotated then the eccentrics P⁴ impart rocking motions to the shafts P² by the use of the arms P³, and the rocking motion of the shafts P² is transmitted by the arms P' and the links P to the connecting bars, for the grate bars to rock the latter. Thus when the machine is running, the grate bars are rocked, to cause the coal delivered onto the uppermost grate bars of the sections C', C², to gradually slip down the grate bars toward the apex of the grate, and the rocking grate bars cause the ashes to fall down into the ash pit R and onto the inclined bottoms R' and R² thereof and from which the ashes are scraped down by scrapers S, S' onto a spiral conveyer T

mounted to turn in the conveyer casing T', into which lead the lower ends of the bottoms R', R². The scrapers S, S' of the conveyer T are preferably of the construction more fully shown and described in the application for Letters Patent of the United States, No. 235,942, above referred to, so that further detail description of the said scrapers S, S' is not deemed necessary, it being sufficient to state that the said scrapers S, S' are in the form of longitudinal bars secured to sprocket chains passing over sprocket wheels attached to longitudinally extending shafts, of which the innermost shafts are driven by a worm gearing U from the shaft Q, and the conveyer T is driven by bevel gears V from the said shaft Q, as shown in Figs. 1 and 2.

It is understood that when the stoker is in use, lump coal fed from the chute G into the crusher F is reduced to a comparatively fine state, and this reduced coal is fed by the conveyers E, E' to the centrifugal feed wheels D, D', which deliver the reduced coal onto the uppermost grate bars of the grate sections C', C², and the rocking grate bars cause the fuel to gradually slide down the grate bars toward the apex of the grate. By the arrangement described the burning fuel is uniformly distributed over the grate, to insure complete combustion, and the ashes falling down into the ash pit R are scraped by the scrapers S, S' down the inclined bottoms R', R² of the ash pit R into the conveyer T which carries the ashes from the furnace A to a suitable place of discharge.

As shown in Fig. 5, the lower section F² of the crusher casing is preferably split and the split sections are engaged by right and left-hand threaded screws F³, to permit of opening the sections of the lower casing in case a piece of iron or like material accidentally is fed with the coal into the crusher. Thus by the arrangement described such a piece of iron can be readily removed by opening the lower section F² by the use of the screws F³ to allow the piece of iron drop out of the casing, and after this has been done the sections are again closed by the screw rods F³.

In the modified form shown in Fig. 6, a crusher W is provided, having a pair of crushing rollers W' between which the coal is fed, to cause the crushing rollers to crush the same. The crushed material is fed by the transverse conveyers W² to longitudinally-extending conveyers W³ which extend into the fire box B, so that the crushed coal is delivered to the grate bars at the sides of the fire box. The rollers W' as well as the conveyers W², W³ are driven by suitable means indicated in Fig. 6, but as this construction may be of any form, it is not deemed necessary to describe the same in detail.

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

1. A mechanical stoker, comprising the following instrumentalities in combination, namely, a crusher for reducing the fuel, a centrifugal feed wheel for feeding the reduced fuel into the fire box, delivery means for conducting the reduced fuel from the said crusher to the said feed wheel, the said feed wheel being connected with and actuated by the said delivery means, a fire box having a grate provided with movable grate bars, an ash remover, a shaft driven from the said delivery means, means for simultaneously actuating the said crusher and the said delivery means, a second shaft, means for actuating the grate bars and the ash remover from said second shaft, and a clutch connection between the said second shaft and the shaft driven from the delivery means.

2. In a mechanical stoker, the combination with a crusher for reducing the fuel, a fire box having a grate provided with grate bars mounted to rock, means for discharging the fuel into the fire box, a conveyer for receiving the fuel from the crusher and delivering it to the said discharging means, a shaft carrying said conveyer, the said discharging means being connected with and actuated by the said conveyer shaft, shafts mounted to rock, connection between the rocking shafts and the grate bars for transmitting the rocking motion of the shafts to said grate bars, a vertical shaft mounted to turn and connected with the said rocking shafts to rock the same, a second vertical shaft driven from the conveyer shaft, a clutch connection between the said vertical shafts, and means for actuating the said crusher and the conveyer simultaneously.

3. In a mechanical stoker for a furnace, the combination with a crusher provided with an outlet, a tubular casing connected with the outlet of the crusher, a conveyer in said tubular casing, a shaft for said conveyer, a casing connected with the tubular casing and through which the shaft of the conveyer extends, the said casing being provided with an outlet leading to the fire box of the furnace, a centrifugal feed wheel in said casing and secured to the conveyer shaft to turn therewith, the said feed wheel discharging into the outlet of the casing, a grate provided with grate bars mounted to rock, a vertical shaft, means for rocking the grate bars from said shaft, a second vertical shaft driven from the conveyer shaft, a clutch connection between the vertical shafts, and means for simultaneously actuating the said crusher and the said conveyer.

4. In a mechanical stoker for a furnace, a fire box having a grate provided with grate bars mounted to rock, a feeding device for feeding fuel into the fire box and comprising

a screw conveyer and a shaft for the same an ash remover, a vertical shaft, means for actuating the grate bars and the ash remover from said vertical shaft, a second vertical shaft driven from the shaft of the conveyer, a clutch connection between the vertical shafts, and means for actuating the conveyer.

5. In a mechanical stoker for a furnace, the combination with a crusher for reducing the fuel, a fire box having a grate provided with movable grate bars, means for discharging the fuel into the fire box, a device for receiving the fuel from the crusher and delivering it to the said discharging means, the said discharging means being connected with and actuated by the said delivery device, a vertically disposed shaft, having a clutch member at its upper end, means for actuating the said grate bars from the said vertically disposed shaft, a shaft driven from the said delivery device and having a clutch member mounted to slide on and to turn with the shaft and adapted to engage the clutch member of said vertically disposed shaft, means for throwing the clutch members out of engagement with each other to stop the movement of the grate bars, a main drive shaft and means for actuating the said crusher and the said delivery device from said shaft.

6. A mechanical stoker comprising a crusher for reducing the fuel, a fire box having a grate provided with movable grate bars, a feeding device for feeding the reduced fuel into the fire box, an ash pit, a conveyer for carrying the ashes from the furnace, means for scraping the ashes from the bottom of the ash pit into said conveyer, means for simultaneously actuating the said crusher and the said feeding device, a shaft driven from the feeding device, a second shaft, a clutch connection between said shafts, and means for actuating the said grate bars, the said scraping means and the said conveyer from said second shaft.

7. The combination with a furnace having a fire box and an ash pit, of a crusher for reducing the fuel, means for discharging the reduced fuel into the fire box, a screw conveyer for receiving the fuel from the crusher and delivering it to the said discharging means, a shaft for the conveyer, a grate provided with grate bars mounted to rock, an ash remover, means for scraping the ashes

from the bottom of the ash pit into the ash remover, a vertical shaft mounted to turn, means for actuating the grate bars, the ash remover, and the scraping means from said vertical shaft, a second vertical shaft driven from the conveyer shaft, the said vertical shafts having clutch members adapted to engage each other, and means for throwing the clutch members out of engagement with each other to stop the movement of the grate bars, the ash remover, and the scraping means.

8. In a mechanical stoker for a furnace, a crusher for reducing the fuel, a fire box having a grate provided with grate bars mounted to rock, a feeding device for receiving the fuel from the crusher and feeding it into the fire box, the said feeding device including a screw conveyer and a shaft for the same, an ash remover, a vertically disposed shaft means for actuating the grate bars and the ash remover from said vertically disposed shaft, a shaft driven from the shaft of the conveyer, a clutch connection between said shafts, and means for actuating the crusher and the said conveyer.

9. In a mechanical stoker for a furnace, the combination with a crusher provided with a casing having outlets at its lower end extending sidewise, tubular casings into the inner ends of which the said outlets of the crusher casing open, conveyers in said tubular casings, a shaft for said conveyers, a fire box having a grate provided with movable grate bars, means for receiving the fuel from the said conveyers and discharging it into the fire box at the sides thereof, the said discharging means being connected with and actuated by the said shaft of the conveyers, means for actuating the conveyer shaft, a vertically disposed shaft mechanism driven from the vertically disposed shaft for imparting movement to the grate bars, a shaft driven from the conveyer shaft and having a clutch connection with said vertically disposed shaft, and means for disengaging said clutch connection to stop the movement of said grate bars.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

THADDIOUS V. ELLIOTT.

Witnesses:

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