E. LUNDGREN.

AUTOMATIC STOKER.

APPLICATION FILED FEB. 9, 1918.

1,397,642. Patented Nov. 22, 1921.

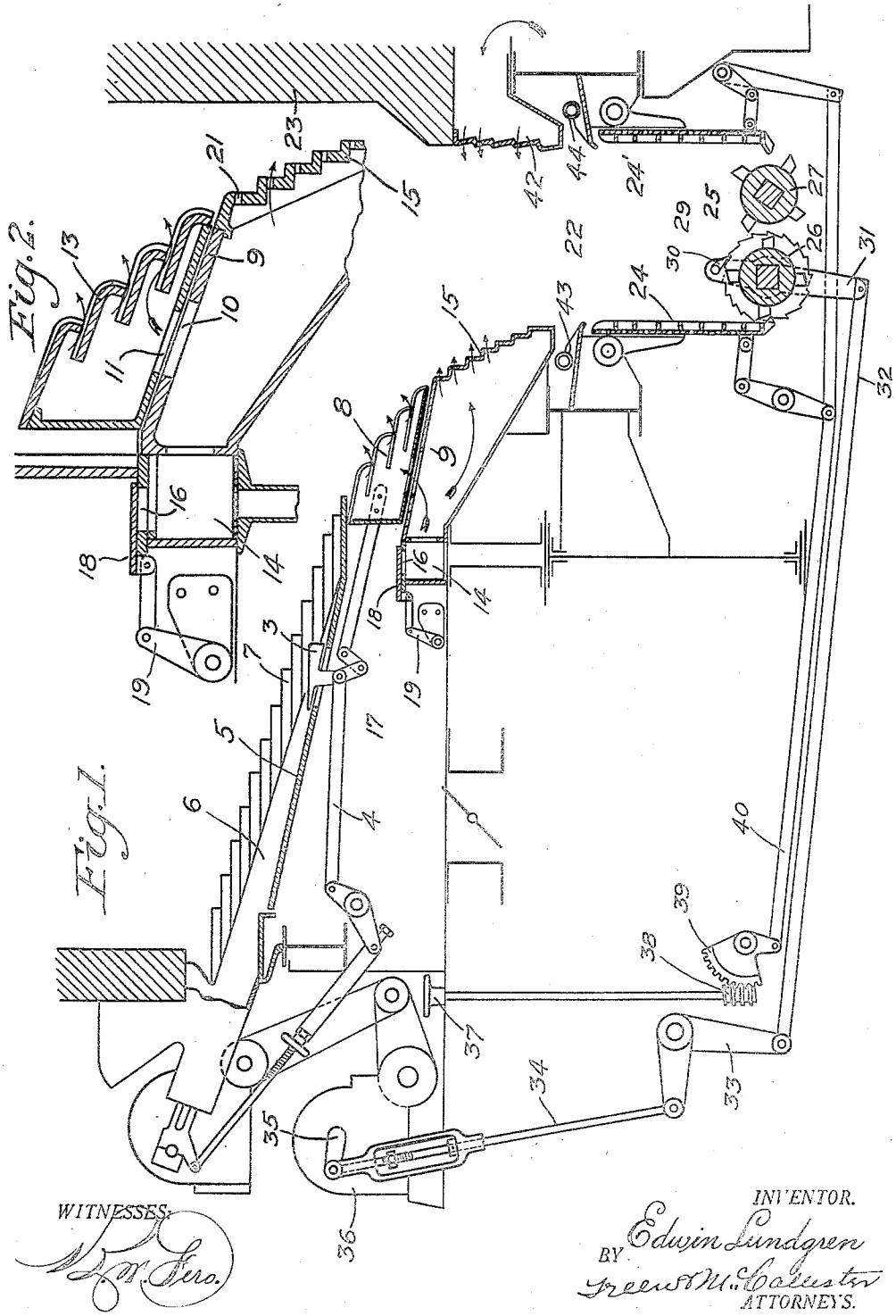


Fig. 1.

Fig. 2.

WITNESSES:

INVENTOR.

BY Edwin Lundgren

Greenough & Colcester

ATTORNEYS.

UNITED STATES PATENT OFFICE.

EDWIN LUNDGREN, OF PITTSBURGH, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE ELECTRIC & MANUFACTURING CO., A CORPORATION OF PENNSYLVANIA.

AUTOMATIC STOKER.

1,397,642. Specification of Letters Patent. Patented Nov. 22, 1921.

Application filed February 9, 1918. Serial No. 216,389.

To all whom it may concern:

Be it known that I, EDWIN LUNDGREN, a citizen of the United States, and a resident of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have made a new and useful Invention in Automatic Stokers, of which the following is a specification.

This invention relates to mechanical stokers and has for an object to produce improved means for discharging ash, clinker and refuse material from a mechanical stoker, especially from a type of stoker known as an underfeed stoker.

A further object is to produce a refuse discharge mechanism for stokers in which means are employed for insuring complete combustion of the fuel prior to its discharge into the ash pit and for cooling the refuse material before it reaches the refuse crushing and discharging device.

A further object is to produce a refuse discharge mechanism for mechanical stokers in which means are provided for preventing bridging and sticking of the refuse material across the refuse discharge receptacle or opening.

These and other objects are attained by means of apparatus embodying the features herein described and illustrated in the drawings accompanying and forming a part hereof.

In the drawings: Figure 1 is a diagrammatic sectional view of a stoker embodying my invention.

Fig. 2 is a detail view of a portion of the apparatus embodying my invention.

In underfeed stokers, it is a relatively simple matter to continuously discharge the ash and refuse material while the stoker is operating at normal capacity. For overload capacities the fuel is fed so rapidly across the fuel supporting surfaces that it is hot upon reaching the refuse discharge mechanism. This is objectionable for three reasons; first, there is the possibility of unconsumed fuel being discharged into the ash pit with the refuse material; second, the hot refuse material is apt to and does burn out the refuse discharge mechanisms, and third, with some types of coal the clinker formation is so excessive that the refuse discharge mechanisms are rendered practically inoperative by the plastic condition of the clinker.

My present invention contemplates means for continually discharging ash and clinker from a mechanical stoker in connection with which means are provided for overcoming the difficulties and objectionable features above enumerated.

In the drawings I have illustrated a well known type of underfeed stoker equipped with a refuse discharge mechanism embodying my invention. The stoker includes alternately arranged retorts and fuel-supporting, air-supplying twyers to which the fuel is delivered from the front of the stoker by means of a ram or other apparatus arranged to force fuel into the stoker at a point below the normal air supply to the combustion chamber. The continual feeding of the fuel into the stoker causes it to move across the fuel supporting surfaces toward the discharge mechanism. This progressive movement of the fuel may be accelerated by gravity, as is the case in the stoker illustrated. It may also be accelerated by means of a ram or pusher located within the fuel contained on the fuel supporting surfaces and operating to break up the fuel bed and to positively move the fuel toward the discharge mechanism. As illustrated, a pusher 3, actuated from the front of the furnace by means of a link 4 and coöperating mechanisms, is located on a floor 5 of a retort 6, the retort being located between two sets of fuel-supporting twyers 7. I have illustrated but one set of twyers and, as shown, they are located in stepped relation, so that they form a fuel support which is inclined downwardly from the front toward the rear of the furnace.

The fuel on issuing from the underfeed section of the stoker, which comprises the retorts and twyer sets 7, is received by an overfeed section 8, which may be considered as forming a part of the refuse discharge mechanism. As illustrated in Fig. 2, the section 8 is hollow, is mounted on a stationary supporting surface 9 which is inclined downwardly toward the rear of the furnace and is provided with an air delivery port 10. The

section 8 is provided in its bottom or supported surface with an air port 11, which is adapted to register with the port 10 and receive air under pressure therefrom.

The section 8 is adapted to reciprocate across the supporting surface 9 and the reciprocatory motion is imparted to it by means of links and suitable levers by the link 4, which actuates the pusher 3. The fuel supporting face of the section is of stepped formation so arranged that it is well adapted to support and occasion a downward and rearward movement of the fuel passing over it. Air delivering twyers 13 are formed in the fuel supporting face of the section 8 and, as illustrated, are adapted to direct a flow of air rearwardly across the fuel supporting faces of the steps formed on the section 8.

Air is delivered to the interior of the section 8, and consequently to the twyers 13, through a supplemental air box 14, which is in open communication with the interior of a stationary air delivering fuel supporting section 15, one of the walls 9 of which supports the section 8. The box 14 is provided with a port 16, which, as shown, communicates with the main air box 17 of the stoker and is provided with a damper 18, adapted to be controlled from the front or the side of the stoker by means of a lever arm 19 and suitable coöperating connections. The ports 10 and 11 in the sections 15 and 8 respectively are so located and are of such dimensions that the flow of air into the section 8 is not affected by the reciprocations of the sections.

As illustrated, the section 15 is provided with a rear, fuel-supporting face, which is serrated or of stepped formation and is provided with openings 21, adapted to deliver air from the interior of the section to the fuel passing across the fuel supporting face thereof.

The sections 8 and 15 in effect form a part of the upper portion of a refuse receptacle 22, which is formed between the overfeed section and the bridge wall 23 of the furnace. The lower portion of this receptacle is formed by means of aprons 24 and 24′ and a fuel crushing and discharging device 25, located between the aprons. As illustrated, the device 25 consists of two coöperating crusher rolls 26 and 27, which are located at the bottom of the receptacle 22 and are adapted to be rotated toward each other for the purpose of crushing and discharging refuse from the receptacle through the space provided between them. Any suitable means may be employed for driving the rolls, but in the apparatus illustrated, I have diagrammatically illustrated a ratchet and pawl connection between one of the rolls and an operating mechanism at the front of the furnace. As shown, the ratchet 29 is rigidly mounted on the shaft of the roll 26, and the pawl 30 is mounted on an oscillating arm 31, which is connected by means of a link 32, a bell crank 33, and an adjustable lost motion connection 34, with a rotating crank 35 forming a part of a driving motor 36. With this arrangement rotary motion is periodically imparted to the roll 26, and the degree of motion so imparted may be varied by varying the adjustment of the lost motion connection 34. It will, of course, be understood that the roll 27 is geared in the usual manner to the roll 26, so that rotary motion is also imparted to it by the driving motor 36.

As shown, the aprons 24 and 24′ are pivotally mounted at a point near their upper edges so that their lower edges are capable of swinging toward and away from the crusher rolls. As illustrated, the adjustment of the aprons is controlled by means of a hand wheel 37 at the front of the furnace and through the agency of a worm 38, rack 39 meshing with the wheel, a link 40 operatively coupled to the rack 38, and link and lever connections between each of the aprons and the link 40.

A stationary air delivering section 42 is provided on the bridge wall or rear side of the refuse receptacle 22 and is located above the apron 24′ and opposite to the section 15. The inner face of this section is serrated somewhat similar to the section 15 and is provided with air delivering openings, air being delivered to the interior of the section from any suitably source and in controllable amounts.

Means are provided for delivering cooling fluid into the receptacle 22 between the section 15 and the apron 24 and also between the section 42 and the apron 24′. As illustrated, water delivery pipes 43 and 44 constitute the means above mentioned, and extend transversely of the furnace. The pipe 43 is located between the section 15 and the apron 24, and the pipe 44 is located between the section 42 and the apron 24′. Each pipe is adapted to deliver a spray of water into the receptacle so that it wets the refuse material moving downwardly toward the rolls 26 and 27. It will, of course, be understood that the pipes 43 and 44 may deliver steam jets instead of water for the purpose of cooling the refuse moving through the receptacle.

It will be understood that the section 8 is preferably formed in short lengths, transversely of the furnace, and that each subdivision may be independent of the others, both in its reciprocations and in its function of delivering air to the fuel bed. It will also be understood that the sections 15 and 42 may be similarly sub-divided for convenience of manufacture and installation, and that the aprons 24 and 24′ may not only be formed in short widths, but that they may also be provided with air supplying

apertures or passages and cooling ribs, such as are customarily employed on fuel supporting surfaces.

The refuse material and unconsumed fuel delivered from the underfeed section of the furnace are broken up by the reciprocatory action of the overfeed section 8 and are impelled by the rearward motion of that section toward the rear of the furnace. The "breaking up action" of the section 8 prevents the formation of large clinkers and therefore prevents bridging of the fuel bed across the upper end of the receptacle 22. The delivery of air through the sections 8, 15 and 42 may be controlled so as to insure complete combustion and thereby prevent unconsumed fuel from being discharged with the ash and clinker into the ash pit. The delivery of cooling fluid or liquid from the pipes 43 and 44 may also be controlled so as to insure that the refuse material reaching the rolls 26 and 27 is sufficiently cool not to damage the discharge rolls and is sufficiently brittle to be readily crushed or broken up and discharged by the rolls.

While I have described and illustrated but one embodiment of my invention, it will be apparent to those skilled in the art that various changes, modifications, substitutions, additions and omissions may be made in the apparatus illustrated without departing from the spirit and scope of the invention as set forth by the appended claims.

What I claim is:

1. A furnace comprising an underfeed section, an air delivery stationary fuel supporting section, a reciprocating air delivery overfeed section supported on the fuel supporting section and adapted to receive fuel from the underfeed section, said stationary and overfeed sections having intercommunicating air passages, and means for delivering regulable amounts of air to one of the last-named sections.

2. A furnace comprising an underfeed section, a rear hollow air delivery fuel supporting section below the underfeed section provided with an air outlet in the upper surface thereof, a hollow air delivering reciprocable overfeed section supported upon the said upper surface and provided with an air inlet registering with the said air outlet, said overfeed section being adapted to move the fuel from the underfeed section on to the rear fuel supporting section, means for actuating the said reciprocable overfeed section, and means for supplying air to the rear fuel supporting section.

3. A furnace comprising an underfeed section, a rear air delivering fuel supporting section, a hollow reciprocable overfeed section between the underfeed section and the rear fuel supporting section and supported on the rear fuel supporting section, air passages intercommunicating between the overfeed section and the rear fuel supporting section, means for supplying regulable amounts of air to the latter section, a refuse receptacle below the overfeed section and at the rear of the rear fuel supporting section, and means for injecting steam into the refuse immediately below the rear fuel supporting section.

4. A furnace comprising an underfeed section, a refuse receptacle, air delivery sections sloping from the underfeed section toward the refuse receptacle and adapted to deliver air into the fuel and refuse, an air delivery section opposite the said air delivery sections adapted to deliver air to the refuse and fuel passing between the opposite sections whereby the refuse is air blasted through a zone of material depth to facilitate complete combustion of the fuel, steam discharging nozzles beneath the opposed sections adapted to inject steam into the refuse whereby the refuse is chilled, and crushing means adjacent the bottom of the refuse receptacle for crushing the refuse.

5. A furnace comprising an underfeed section, an air-delivering overfeed section receiving fuel from the underfeed section, and reciprocal for the purpose of impelling and breaking up the fuel passing over it, in combination with a refuse crushing and discharging device located below said overfeed section, and a receptacle forming structure comprising pivotally mounted air-delivering aprons located in front and at the rear of said device and extending above said device, stationary air delivering members located above said aprons and forming therewith front and rear walls of the receptacle, and means operated from the front of the furnace for swinging the free edges of said aprons toward and away from said device.

6. A furnace comprising an underfeed section, an air-delivering overfeed section receiving fuel from the underfeed section, and reciprocal for the purpose of impelling and breaking up the fuel passing over it, in combination with a refuse crushing and discharging device located below said overfeed section, and a receptacle forming structure comprising pivotally mounted air-delivery aprons located in front and at the rear of said device and extending above said device, stationary air delivering members located above said aprons and forming therewith front and rear walls of the receptacle, and means for holding the free edges of the aprons adjacent to said device and for swinging the aprons toward and away from said device.

7. An ash discharge mechanism for mechanical stokers, comprising at least one refuse discharging roll located at the bottom of a receptacle formed between the bridge

wall and the fuel supporting elements of the furnace, in combination with a pair of pivotally mounted air-delivering aprons located in the front and in the rear of said mechanism, stationary air delivering sections located above and forming with said aprons front and rear walls of the receptacle, means actuated from the front of the furnace for holding the free edges of said aprons adjacent said mechanism and for swinging said aprons toward and away from said mechanism.

In testimony whereof, I have hereunto subscribed my name this 2nd day of February, 1918.

EDWIN LUNDGREN.

Witness:
C. W. McGHEE.