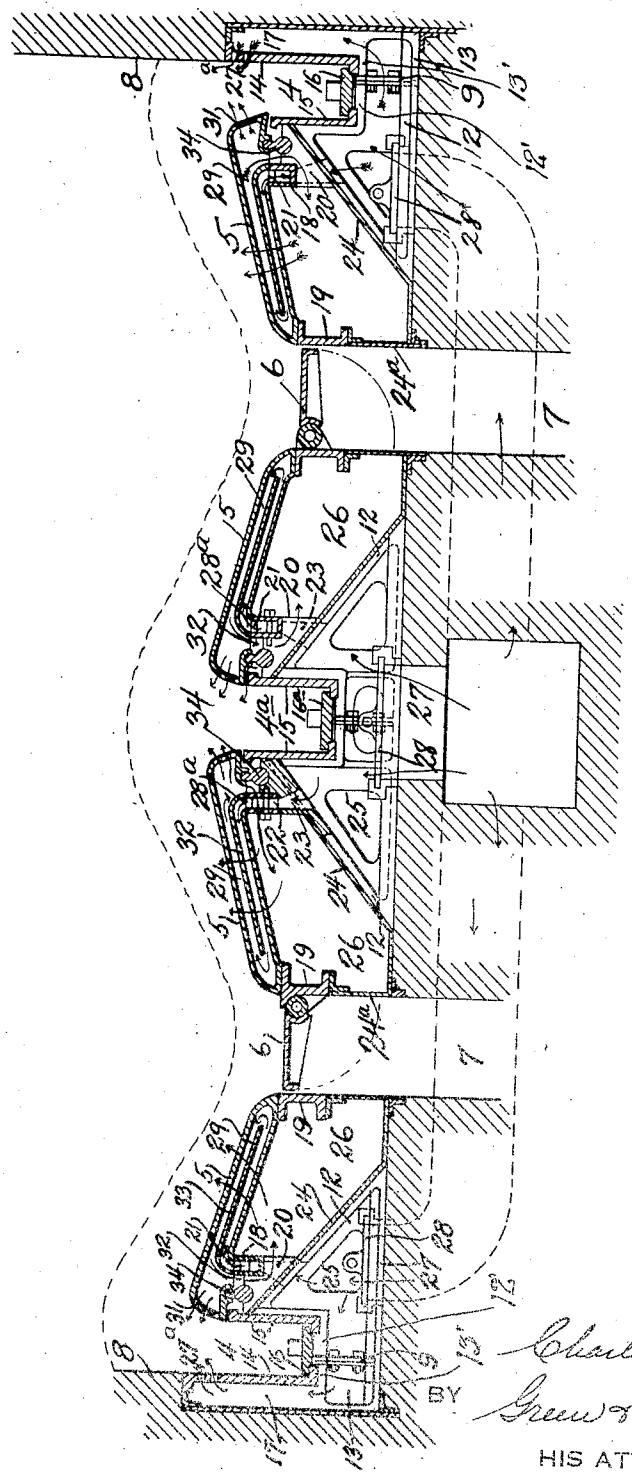
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MULTIPLE SECTION HORIZONTAL UNDERFEED STOKER.

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INVENTOR.

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MULTIPLE-SECTION HORIZONTAL UNDERFEED STOKER.

1,352,467. Specification of Letters Patent. Patented Sept. 14, 1920.

Application filed September 19, 1916. Serial No. 120,980.

To all whom it may concern:

Be it known that I, CHARLES F. MILLER, 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 Multiple-Section Horizontal Underfeed Stokers, of which the following is a specification.

This invention relates to horizontal underfeed stokers and has for an object to produce a stoker of that type, which is of simple construction, has a high fuel burning capacity, and is simpler to operate than other stokers of the same type now in commercial use and known to me.

A further object is to produce a horizontal underfeed stoker so constructed and arranged that a stoker of substantially any desired capacity may be readily constructed by merely assembling one or more standard stoker sections.

Underfeed stokers of the horizontal type are well known. Those in commercial use are provided with a centrally located horizontal retort, which extends from the front to the rear of the furnace and is adapted to feed fuel onto and over grate bars or dead plates, which are located on both sides of it and are elevated so that they are either above or on a level with the upper edges of the retort. In some stokers the grate bars or dead plates are inclined downwardly from the retort and are adapted to discharge ash and consumed fuel onto dump grates, which are located between the grate bars and the adjacent side walls of the furnace. Such an arrangement of fuel supporting surfaces renders it exceedingly difficult to clean the fires, since it has been found by experience that clinkers adhere to the side walls of the furnace and that they can only be removed with great difficulty. Access to the fire box is ordinarily had from the front of the furnace only, and consequently long punch bars, wielded by the stoker attendants, must be depended upon for freeing the clinkers from the side walls.

In an application for Letters Patent entitled, "Multiple feed horizontal underfeed stokers," filed by me on the 19th of September, 1916 and serially numbered 120,978, I have illustrated and described a type of horizontal underfeed stoker, which may be termed a central ash discharge stoker and is so constructed and arranged that it eliminates the difficulties encountered with the horizontal underfeed stokers now in commercial use. The stoker described and illustrated in that application includes two horizontal fuel feeding retorts, which extend from the front to the rear of the furnace and each of which is located adjacent to one side wall of the furnace. Fuel issuing from each retort is fed onto an adjacent set of grate bars, which extend from the retorts inwardly toward centrally located dump grates. The dump grates are located between the inner edges of the two sets of grate bars, extend from the front to the rear of the furnace and are adapted to discharge into an ash pit, located below the central portion of the furnace. With this arrangement of apparatus the side walls of the furnace are protected by the fuel issuing from the retorts and the difficulty encountered in clearing the fires, with the ordinary type of horizontal underfeed stokers, is entirely eliminated, since clinker can form only at the center of the furnace and at a point where there is substantially no tendency for it to adhere to stationary parts of the furnace.

A specific object of my present invention is to produce a simplified form of horizontal underfeed stoker, of the central ash discharge type, which is so constructed that the capacity of the stoker may be increased by merely adding additional standard sections.

The objects enumerated, and others which will be made apparent throughout the further description of the invention, are attained by means of a stoker embodying the features herein described and illustrated in the drawing accompanying and forming a part hereof. In the single sheet drawing I have illustrated in transverse, vertical section a multiple section stoker embodying my invention.

The stoker illustrated in effect includes four complete stoker sections, so arranged as to form two multiple retort stokers located side by side.

Each complete section includes a retort which extends from the front to the rear of the furnace and is adapted to receive fuel from a hopper or other receptacle preferably located at the front of the furnace. Fuel is fed into the retorts at a point below

the surface of the fuel contained therein and the upheaval of the fuel, occasioned by this method of feeding, causes the fuel to issue from the mouth of the retort and to be delivered onto an adjacent set of grate bars 5. Any suitable means, such as reciprocating plungers, may be employed for feeding fuel into and through each retort. The grate bars 5, as illustrated, extend substantially at right-angles to the longitudinal axis of the retorts and the bars of each set are inclined downwardly away from the retort which feeds fuel onto the set. A dump grate 6 is located between each pair of adjacent sets of grate bars and, extending from the front to the rear of the furnace, is adapted to discharge into an ash pit 7 located below it and at a point intermediate the side walls of the furnace.

While the furnace illustrated in effect includes two complete stockers it is provided with but three retorts, namely, two lateral retorts 4 and a central retort 4^a, which is adapted to feed fuel onto two set of grate bars 5, one set being located on each side of it. The lateral retorts 4 are located immediately adjacent to the side walls 8 of the furnace and each is mounted on two or more pedestals 9, which are so spaced as to form a rigid support for the retorts and also for the grate bars 5 mounted on them.

Each supporting pedestal, of a lateral retort, is formed in two parts 12 and 13. Each part 12 is substantially triangular in shape, but is provided with a lateral offset portion 12′, which forms a retort supporting shoulder and is adapted to be secured to a similar offset portion or shoulder 13′ with which each part 13 is provided. When the two-part pedestal is assembled, a retort mounting recess is provided in it, which forms a frame on which the side walls 14 and 15 and the base plate 16 of the retort 4 are mounted.

In the stoker illustrated the side wall 14 is essentially a side wall for a lateral retort 4 and is adapted to be rigidly secured to uprights 17, of the pedestal parts 13.

Each set of grate bars 5 is mounted on an air box 18 and a support member 19. Both the air boxes and the members 19 extend parallel to the longitudinal axis of the retorts and each air box is mounted on supporting lugs 20, formed on the pedestal parts 12. Each pedestal part 12 is provided with one of the lugs 20 and air boxes, rigidly secured to these lugs, form tie members for alined pedestals.

As illustrated each air box is box-like in cross-section and its interior passage communicates with ports 21 formed in the upper or grate bar supporting face of the box. The ports 21 are equally spaced along each box and each is adapted to deliver air under pressure to an air passage formed within one of the grate bars supported on the box. Each air box is also provided with air inlet ports 22, so spaced that they register with air delivery ports 23 formed in the lugs 20 of the pedestals supporting the air box.

Each pedestal 9 forms a support for partition plates 24, which divides the space below each retort and its coöperating set of grate bars into two chambers 25 and 26. The former chamber may be termed the primary air chamber and, as illustrated, receives air under pressure through a port or passage 27 which may be provided with a control valve 28. The chambers 26 may be termed secondary air chambers and each is located below one set of grate bars 5. The plates 24 are mounted on the inclined edges of the pedestal parts 12 and abut against the side wall 15 of the adjacent retort. With this arrangement the ports 22, formed in the lugs 20 of the pedestal parts 12, receive air from the primary air chamber 25 and deliver it to the air box 18 mounted on the lugs. Air is also delivered from each primary air chamber 25 forming a part of each lateral stoker section to twyer openings 27^a, formed near the upper edge of the side wall 14 of a retort 4. Each set of twyer openings 27 is in free communication with one of the lateral chambers 25, through a passage 17 formed between the retort side wall 14, in which the openings are formed, and the adjacent side wall 8 of the furnace.

Each grate bar 5 is provided with a port 28^a, which is adapted to register with one of the ports 21 formed in the grate bar supporting air box and is adapted to deliver air from the air box to a passage 29 formed within the grate bar. The passage 29 extends along the lower face of the grate bar toward the ash delivery or lower end thereof. At the ash delivery end of the bar the passage is reversed in direction and extends back along the upper face of the grate bar to the retort end of the bar. Twyer openings 31 are formed in the retort end of the bar and a port 32 is formed in the lower face of the bar, immediately adjacent to the port 28, but separated therefrom by the partition or diaphragm 33, which forms the U shaped passage 29 within the hollow grate bar. The port 32 of each grate bar communicates with and is adapted to deliver air into the chamber 26, located below the grate bar. The air delivered to each secondary air chamber is delivered to the fuel bed through openings located between the grate bars of the set located above the chamber. As illustrated in the drawing, the grate bars of each set are operatively connected to a rock shaft 34, which is journaled on the lugs 20 of the pedestals coöperating with the set, and is located within the secondary air chamber below the set.

The central retort 4^a delivers fuel to two

sets of grate bars 5. Each set is similar in all respects to the sets located at the sides of the furnace and forming a part of the lateral stoker sections. The retort 4^a is similar to each lateral retort 4, except that it is wider and it is not provided with a side wall 14 having twyer openings 27^a, but is provided with two side walls 15.

Each mounting pedestal 9, of the retort 4^a, comprises two pedestal parts 12 instead of a part 12 and a part 13, as described in connection with the lateral stoker section. The partition plates 24, mounted on these pedestals, divide the space below the retort 4^a and the grate bar sets coöperating with it, into three chambers, a primary air chamber 25 and two secondary air chambers 26. The primary air chamber of the central stoker sections, like the primary air chambers of the lateral sections, partially surrounds the retort and receives air under pressure through a port or passage 27, which may be provided with a control valve 28. Each secondary air chamber of the central section is located below one set of grate bars 5 of that section.

The support members 19 are preferably mounted on the front and rear walls of the furnace and, as illustrated, partition plates 24^a are arranged so as to cut off communication between each secondary air chamber and the adjacent ash pit. Each dump grate 6 is pivotally mounted on one of the members 19 and is adapted to serve two seats of grate bars 5.

One of the principal features of the present invention is that all of the parts are of standard size and construction and consequently one or more stoker sections may be assembled into a complete stoker without the necessity of specially designing parts for stokers composed of different numbers of sections. For example, the grate bars 5, the separate pedestal parts 12 and 13, the grate bar supports 19, the air boxes 18, the rock shafts 34, the dump grates 6, and even the partition plates 24 and 24^a are all of standard size and construction, and consequently various arrangements of stoker sections may be obtained by merely varying the manner of assembling these elements. It will be clearly apparent from the drawings that the stoker illustrated may be converted into double instead of a triple retort stoker by removing two stoker sections and by substituting one of the lateral pedestal parts 13 for one of the pedestal parts 12 in each pedestal supporting the central retort. This will necessitate a reconstruction of the central retort 4^a so that it will conform in shape and size to a side retort 4. This reconstruction, however, is accomplished by merely substituting a lateral retort base plate 16 for the base plate 16^a and by substituting a side wall 14 for one of the side walls 15. It will also be apparent that additional sections may be added by merely substituting for the pedestal parts 13 of the lateral pedestals, additional pedestal parts 12 and that in this way a stoker of any number of sections may be formed. It will also be apparent that a central-retort lateral ash discharge stoker may be formed from the stoker illustrated by removing the retorts 4 and the grate bar sets coöperating with them or in other words by removing the lateral stoker sections.

The operation of the stoker illustrated is as follows: Fuel is delivered to each of the retorts 4 and 4^a. The fuel issuing from the retorts is discharged onto and across the grate bars 5 and onto the dump grates 6. The distribution of the fuel across the fuel supporting surfaces is aided to some extent by the inclination of the grate bars and by the reciprocation thereof. The forced draft delivered to the stoker is received by the primary air chambers 25 and is delivered by the air boxes 18 to the grate bars 5. It is also delivered to the twyer openings 27^a of the lateral retorts 4 and in this way the entire fuel bed receives air under pressure and the grate bars are cooled, whereas the air passing through them is preheated. Any fuel sifting, which may occur, drops into the secondary air chambers 26 and may be readily removed from the furnace through openings not shown, but which may be formed in the front of the furnace and in communication with the secondary air chambers. It will also be apparent that fuel sifting in no way hampers the operation of the moving grate bars, since it cannot detrimentally affect the moving parts, nor can it enter the main air passages of the stoker.

While I have described 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 multiple-section underfeed stoker comprising two lateral retorts each extending from the front to the rear of the stoker, and each located adjacent to a side wall of the furnace, a central retort located between the lateral retorts, a dump grate between each lateral retort and the central retort, a set of grate bars between each retort and the adjacent dump grate, and means for delivering air under pressure to each grate bar of each set.

2. An underfeed stoker comprising a horizontal fuel feeding retort, grate bars receiving fuel from the retort, supporting members for the retort and grate bars, each grate bar having an air delivery passage formed therein and extending from an inlet

port adjacent the retort end of the bar along the bottom of the bar to the dump grate end thereof and back along the upper face of the bar to the retort end thereof and terminating in an outlet passage discharging into the space beneath the grate bar, each grate bar also having at the retort end twyer openings in communication with the passage thereof, and a dump grate receiving fuel from the grate bars.

3. A grate bar for use in a retort stoker with one end adjacent a retort, having a passage formed therein and extending from an inlet port adjacent the retort end thereof along the lower face to the other end thereof and back along the upper face to the retort end and also having twyer openings and a delivery port formed in the retort end of the bar and communicating with the passage, the said delivery port being adapted to discharge into the space beneath the bar.

4. A multiple retort stoker, comprising a central retort and two side retorts, an ash discharge mechanism between each side retort and the central retort, a set of grate bars between each retort and each adjacent ash discharge mechanism, a central retort support, comprising similar and interchangeable pedestal members secured together, and lateral retort supports comprising pedestal members similar to the pedestal members first named and interchangeable therewith, and lateral retort supporting members secured thereto.

5. In an underfeed stoker consisting of alternately arranged retorts and grate bar sets, a retort and grate bar support made up of two interchangeable and similar pedestal members, each member being provided with a grate bar supporting lug, and a retort supporting shoulder, so arranged that the retort supporting shoulders of two members cooperate in supporting a single retort.

6. A support member adapted for interchangeable use with retort stokers comprising a pedestal member having a retort supporting offset formed thereon and an air delivering grate bar supporting lug formed thereon, each member being adapted to be secured to similar members to form a retort supporting frame with grate bar supporting lugs on each side of said frame.

7. Stoker mechanism comprising a side retort adapted to serve one set of grate bars, and a central retort adapted to serve a set of grate bars on opposite sides thereof and having greater capacity than the side retort, the side retort having at least one side member interchangeable with the side members of the central retort, and interchangeable support members for supporting the interchangeable side members.

8. Stoker mechanism comprising a side retort adapted to serve one set of grate bars, and a central retort adapted to serve a set of grate bars on opposite sides thereof and having greater capacity than the side retort, the side retort having at least one side member interchangeable with the side members of the central retort, an interchangeable support for each of the interchangeable side members adapted when joined to form a central retort support to maintain a determined distance between the side members, and a support for one of the side members of the side retort adapted to be joined with an interchangeable support to maintain the side members of the side retort in closer relation than the side members of the central retort.

9. A stoker mechanism comprising a plurality of similar interchangeable stoker sections, each comprising a set of grate bars having a fuel receiving end an an ash discharge end, supporting members at the fuel-receiving and ash-discharge ends of the grate bars adapted to support the grate bars in inclined position with the fuel receiving ends uppermost, a retort side member carried by the supporting member adjacent the fuel receiving end of the set of grate bars, the supporting member at the fuel-receiving end of each section being adapted to be joined at its retort end to the supporting member of an opposite section so that the retort side members are held in spaced relation whereby a fuel retort is formed between two adjacent stoker sections.

10. A stoker mechanism comprising a plurality of similar interchangeable stoker sections; each section comprising supporting members, retort and ash pit side walls adapted to be secured in place with reference to said members, and a set of grate bars supported on the members in inclined position with the fuel receiving end uppermost and adjacent the side wall of the retort and having the bars extending from the retort wall to the ash pit wall; the said sections being adapted when retort ends are placed together to form a fuel retort between the sections, and when the ash pit ends are placed together to form an ash pit between them whereby a plurality of similar interchangeable sections may be combined to form a furnace having any desired number of alternate retorts and ash pits.

11. A stoker mechanism comprising a plurality of similar interchangeable stoker sections; each section comprising supporting members, retort and ash pit walls adapted to be secured in place with reference to said members, a set of grate bars supported on the members in inclined position with the fuel receiving end uppermost and adjacent the side wall of the retort, and having the bars extending from the retort wall to the ash pit wall, the said sections being adapted when retort ends are placed together to

form a fuel retort between the sections, and when the ash pit ends are placed together to form an ash pit between them whereby a plurality of similar interchangeable sections may be combined to form a furnace having any desired number of alternate retorts and ash pits, and means adapted to be attached to the retort end of the support to complete a retort when the assembled furnace structure terminates with retort ends adjacent the furnace wall.

12. A stoker mechanism comprising a plurality of similar interchangeable stoker sections; each section comprising supporting members, a partition carried by some of the members and dividing the section into two compartments, a set of grate bars supported in inclined position upon the supporting members above the compartments, said bars having air passages extending therethrough adapted to receive air from one of the compartments and to discharge the air into another of the said compartments, a retort wall and an ash pit wall secured in place with reference to said members, respectively, adjacent the upper and lower ends of said bars; the said sections being adapted, when the retort ends are placed together, to form a fuel retort therebetween, and, when the ash pit ends are placed opposite one another, to form an ash pit between them, whereby a plurality of similar interchangeable sections may be combined to form a furnace having any desired number of alternate retorts and ash pits.

In testimony whereof, I have hereunto subscribed my name this 18th day of September, 1916.

CHARLES F. MILLER.