July 12, 1932. M. RATEL 1,867,474

STOKER

Filed June 29, 1928

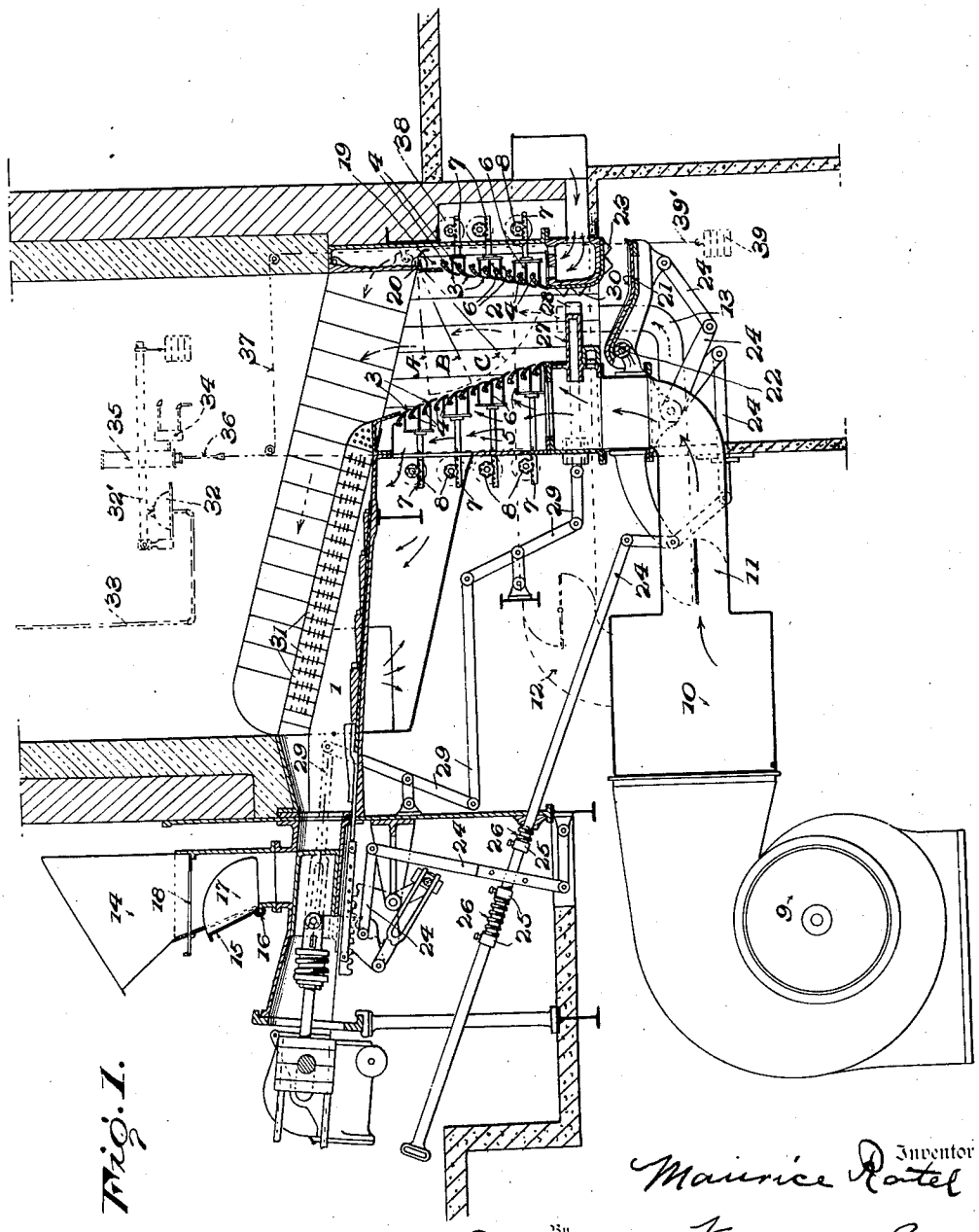

Fig. 1.

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Patented July 12, 1932 1,867,474

UNITED STATES PATENT OFFICE

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STOKER

Application filed June 29, 1928, Serial No. 289,167, and in France July 8, 1927.

The present invention relates to automatic stokers and has for its object to increase the efficiency and eliminate the faults of such stokers as at present constructed, particularly to decrease the expense of maintenance and loss of combustible ashes, provide ready access to the feeding means for such stokers in order to readily remove any matter producing clogging or stopping of the feeding, and to improve the ash pockets, and provide simple means for ejection of the refuse.

As herein shown, for the purpose of illustrating the invention, the same is applied to a stoker of the underfeed and multi-retort type, but it is to be expressly understood that the invention, either in whole or in part, may be applied to other types of stokers or furnaces with such variations as may be suitable for the particular type to which it may be applied.

In automatic stokers as at present constructed, the amount of air supply to the fuel bed is varied and decreased as the fuel bed advances towards its ejection point. This method has several important defects. This control or adjustment of the air supply has been effected by means of successive compartments into which the wind box is divided, said compartments being provided with dampers controlling the volume of air passing through the various compartments, which volume decreases progressively towards the zone of ejection. In this ejection zone, the partially consumed fuel and the clinkers arrive in a burning state, and as the volume or air supply thereto is decreased to a practically zero point, these parts of the stoker receive a very small volume of air and there is practically no cooling of said parts. This results in costly maintenance, and the clinkers stick on the stoker parts and prevent the ready ejection of the refuse.

It is one object of the present invention to eliminate these defects. This is accomplished by admitting air to the part or parts where the ejection takes place and causing the air to flow in an opposite direction to that of the movement of the fuel bed, all compartments and dampers being entirely eliminated, and means being provided for directly varying the sections of the air passages through the various parts forming the surface of the stoker and the support of the fuel bed, such as the grate bars, tuyères, plates, etc. This counter flow of air produces an efficient cooling of every part of the stoker, and consequently the elimination of the faults above pointed out, and the air for combustion is progressively preheated and arrives at the points where the feeding of the green fuel is effected at the proper temperature to insure perfect distillation and combustion of the fuel with maximum efficiency.

In case an ash pocket is employed, the total air currents arrive first and at maximum pressure at the lower or ejection part of the refuse of the stoker. This insures perfect cooling of the parts and the passage of the air through the thickness of the deep bed of refuse whereby it becomes preheated as it rises. When supplying air to the ash pocket at other points than at the bottom, it is caused to enter the ash pocket in a decreasing quantity from the lower part to the upper part of the pocket.

The new method of counterflow air supply and the control of the supply in the various parts of the stoker, serve to eliminate the faults existing in devices having compartments or zones, and insure the required cooling of all the stoker parts, and of the total mass of refuse before its ejection. It also materially decreases the loss of combustible in the refuse.

By the method of the present invention of circulating and controlling the air supply to the various parts in the stoker as the speed and pressure of the air delivered by the fan increases, the amount of air supplied in the zone of ejection, ash pocket or other device, will increase proportionately and the proper amount of air will always be supplied at all points, regardless of the rate of combustion, and hence any loss of combustible in the refuse will be eliminated. Such adjustments of areas of air passages may be effected manually, but preferably the same are secured by automatic means.

The existing ash pockets have the following defects, among others. They result in a high loss of B. t. u. at the lighting of the fuel bed. If the pocket is not filled with refuse, it is impossible to supply air to the pocket as this would cause an excess of air, and consequently a high loss of efficiency. If the dampers of the various compartments corresponding to these air pockets are closed, all the unburnt coke which falls from the stoker into these pockets will accumulate in the pockets and remain unburned, since such coke would not receive the air necessary to support combustion. Now when the pockets become full of coke and air is supplied thereto, all of this mass of coke will be ignited in mass, acting as in a blast furnace and causing the rapid destruction of the metallic parts composing the ash pocket.

By the present invention the ash pocket is formed with one or both its side walls mounted to rotate around their upper part, thereby prolonging, during the lighting period, the surface of the stoker. Thus when the furnace is first lighted, this part can be used as an active surface for the lighting. Once the bed of refuse becomes sufficiently thick, one of the walls of the pocket is progressively lowered, thereby forming a preliminary small ash pocket. At a later period, the wall is still further lowered, thereby progressively increasing the depth of the ash pocket until the wall has assumed its normal position, at which time the pocket will be full of refuse.

In coal feeding devices of the ram type at present used, when foreign matter clogs the feeding mechanism, it is necessary to empty the coal-hopper while the foreign matter is removed.

By the present invention a swinging door is provided at the lower part of the hopper corresponding to each feeding ram, the door being provided with side walls to prevent the fuel from falling into the boiler room when the door is opened. Such door may, if desired, be combined with means for stopping the fall of the combustible from the upper part of the hopper corresponding to the clogged section.

The present invention provides for the ejection of the refuse by the action of swinging plates or grates preferably moved in the opposite direction from that of the adjacent sections. These plates or grates crush the fuel against serrated or other devices placed above their rear, and an elastic safety device is provided to eliminate or avoid any breaking should an abnormal great resistance be offered by any foreign or other matter. By reason of these oscillating movements in opposite directions for the adjacent sections, the mass of refuse will continuously receive a reciprocating up and down motion which will prevent the formation of large masses of cinders or other refuse. Moreover, should a big block of foreign matter be encountered, the same can be easily eliminated by increasing the stroke of oscillation of the corresponding plate and that without any fall of the mass of refuse, as is the case with existing devices of roll grinders, rockers or other means having vertical plates. Such ejecting plates may be advantageously combined with any type of clinker plate employing either rocking or any other motion.

The invention will be readily understood by reference to the attached drawing, which drawing is for illustration purposes only and show one embodiment of the inventive idea, but it is to be expressly understood that such drawing is for the purpose of illustration only and is not designed to define the limits of the invention, reference being had to the claims for this purpose.

The drawing illustrates the invention as applied to a multi-retort underfeed stoker and in longitudinal section through the axis of a retort.

Fig. 1 is a longitudinal section through a retort illustrating one form the invention may assume.

I will first describe the construction shown in Fig. 1.

In said drawing, 1 is a retort with its mechanism for feeding or separating or distributing the material and 2 is the ash pocket whose walls are composed of plates or grate bars 3 which preferably overlap each other. Each of these bars as shown is capable of rotating about an axis 4, supported in the side walls 5, 19 of the boxes corresponding to each retort 1. Connecting rod 6 is secured to each grate bar 3, which rods are secured to rack bars 7 operated through pinions 8. By the reciprocation of these rack bars, the grate bars 3 may be rocked around their axes in order to vary the areas between the respective grate bars and hence vary the amount of air that may pass between two adjacent bars. A suitable blower 9 delivers air to a duct 10, which duct is connected with the lower part of the ash pocket 2 by means of an air duct 11 shown in full lines, or if preferred a duct 12 shown in dotted lines, or by both such ducts. These ducts deliver air into the lower part of the ash pocket 2, the course of the air being indicated by the arrows. An air duct 13 is provided to supply air to the air pockets forming the lateral walls of the ash pocket 2 and of the furnace. The fuel hopper 14 has on its lower part a door 15 turning on an axis 16, said door being provided with lateral walls 17, which, when the door is opened, prevent fuel from falling out of the hopper. A slide plate 18 is provided which, when pushed into the position shown in the drawing, will close the lower part of the hopper 14 and prevent falling of fuel contained in the upper part

of the hopper, and thus permit the removal through the door 15 of any matter clogging the feeding means without the possibility of fuel falling into the boiler room.

The reference numeral 19 indicates the lateral wall of a frame on which is secured bars 3. This frame is mounted to turn on a horizontal axis 20 into the positions indicated by the dotted lines A, B and C. In lighting the fire, the rear grates carried by this frame will be turned into the position A, and as the amount of refuse delivered thereto increases, it will be lowered first to the position B and then to position C, and finally to its normal working position shown in full lines in the drawing. A device composed of plates or grates 21 is mounted to turn around an axis 22, said plates or bars 21 being placed opposite toothed portions 23 near the bottom of the ash pocket and are employed to crush the refuse against said teeth during the process of ejecting the refuse. Suitable means are provided for driving these crushing grates or plates 21, such means as shown consisting of rods or links 24 connected to feeding mechanism as shown. Any other suitable means for operating the crushing bars 21 might be employed. The thrust of the feeding device on said connecting links is controlled by adjustable collars 25, allowing the adjustment of the stroke of the oscillation of the plates 21 according to the grades of fuel, and if necessary to dump them totally should a large block of foreign matter occur, or to draw the fires immediately if desirable by the bursting of a boiler tube or otherwise. Elastic devices 26 are provided to guard against any breaking of the stoker parts should foreign matter be encountered in large masses in the refuse.

If desired a clinker crusher 27 is provided with teeth or corrugations 28. This crusher is reciprocated by means of links and lever connections 29 connecting the same with the power means for driving the ram of the stoker, and by its reciprocating connection lumps of refuse are crushed against the teeth 30 near the bottom of the stoker. Tuyères 31 of any suitable type are provided, which tuyères are preferably of the type shown and described in my U. S. Patent No. 1,635,501, though grate bars turning around horizontal axes to vary the areas between them might be employed. Such grate bars, or plates, might have, for example, a shape like grate bars 3 of the ash pocket with rods, cams or other devices to operate the same to vary the area for the passage of air between the adjacent bars. For example, according to the grades of fuel or the rates of combustion, it may be advantageous to supply a small amount of air at the lower part of the tuyères where the distillation of fuel begins, and this air supply may be increased toward the upper part of the tuyères or increased toward the middle part of the tuyères and then decreased toward the upper part of the same, or be varied in any other suitable way, all of which devices for the control of air in the various parts of the furnace may be actuated either manually or automatically.

In the drawing is shown an automatic device for this purpose in which 32 is a regulating device actuated by steam pressure conveyed through the pipe 33. This regulator 32 acts through a lever 32′ and a fluid delivering device 34 to which fluid under pressure is supplied by the action of a piston moving in cylinder 35. The piston rod 36 is connected as by a cable 37 or other suitable means to drums, or pulleys 38 operatively connected to the axles driving the pinions 8 for moving the racks 7. These drums, or pulleys, 38 may have either the same or different diameters in order to vary the space through the various grate bars, or plates, composing the surface of the stoker-support of the fuel bed, which variation may be constant, uniform or different in character as the circumstances may require. Suitable counterweights 39 are connected, as by cable 39′, to these parts to facilitate their operation.

While, as here shown for purpose of illustration, the regulator 32 is driven by steam pressure it will be readily understood that the same may be actuated by air under pressure or other suitable means.

It will be readily appreciated by those skilled in the art that some of the parts herein shown and described, might be omitted without affecting the action of other parts and that while, for the purpose of describing the invention, all of these parts are shown as cooperative, the invention is not limited to a form having all of the parts in a single structure or with any particular type of furnace. Any of the parts or combinations of parts falling within the terms of the appended claims are intended to be protected hereby.

What is claimed is:

1. In the operation of a furnace, the method which consists in providing continuous, moving fuel and refuse beds, constantly maintaining said beds, continuously flowing a single current of air past said fuel and refuse beds in a reverse direction to the movement of said beds, and supplying air from said air current to the refuse bed and to the fuel bed to support combustion.

2. In the operation of a furnace, the method which consists in providing continuous, moving fuel and refuse beds, constantly maintaining said beds while continuously dumping refuse from the refuse bed, continuously flowing a single air current past said refuse bed and said fuel bed in a reverse direction to the movement of said beds, and supplying air from said current to the refuse bed and to the fuel bed to support combustion.

3. In the operation of a furnace, the meth-

od which consists in providing continuous, moving fuel and refuse beds, constantly maintaining said beds while continuously dumping refuse from the refuse bed, continuously flowing a single air current past the refuse bed and fuel bed in a reverse direction to the movement of said beds, and supplying air to the fuel bed and in varying amounts to the refuse bed from said current to support and complete combustion.

In testimony whereof I have signed this specification.

MAURICE RATEL.