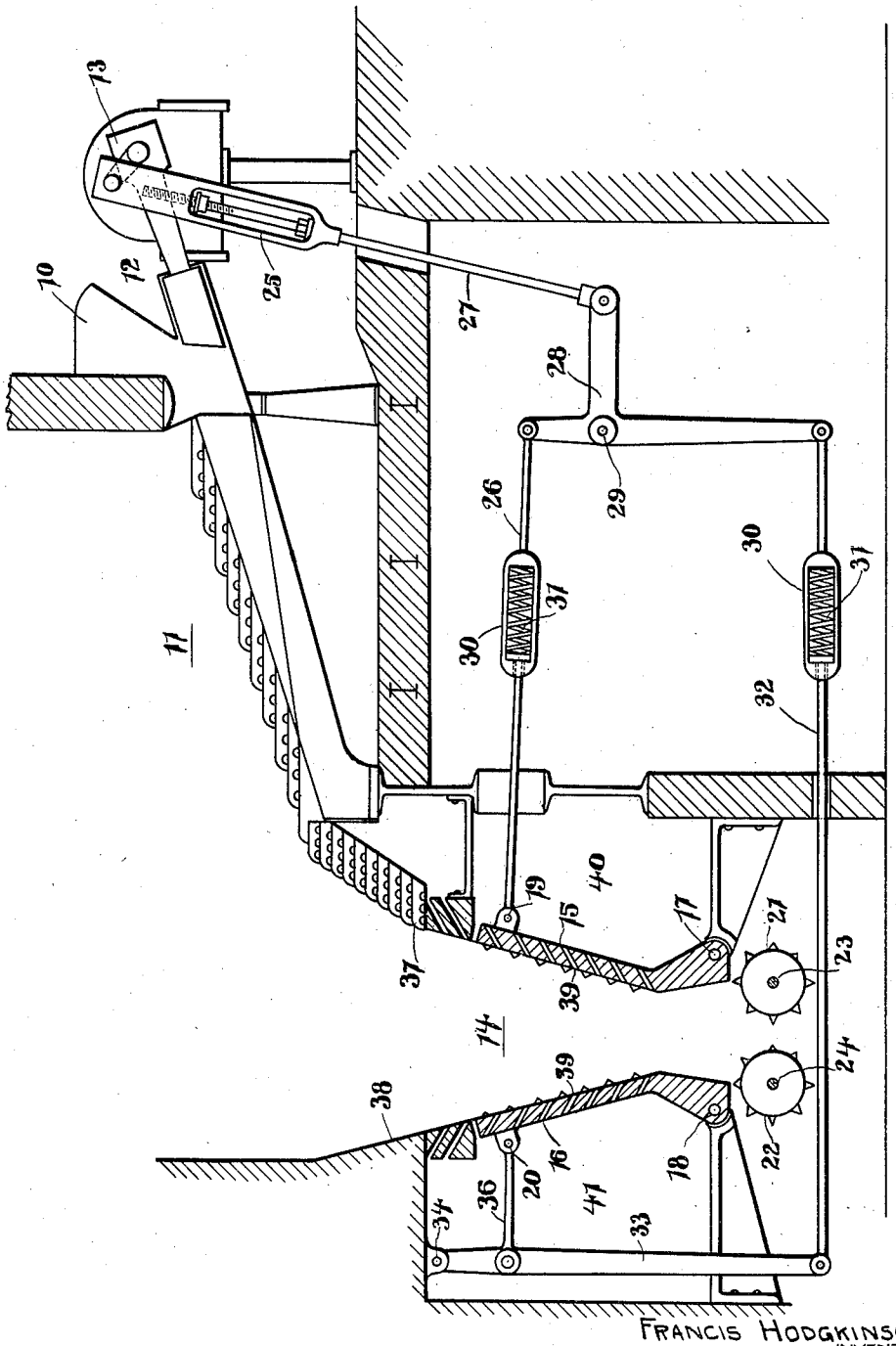
March 15, 1927. 1,620,659

F. HODGKINSON

CLINKER GRINDER

Filed April 12, 1921



FRANCIS HODGKINSON.
INVENTOR.

BY D. C. Davis
ATTORNEY

Patented Mar. 15, 1927. 1,620,659

UNITED STATES PATENT OFFICE.

FRANCIS HODGKINSON, OF SWARTHMORE, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

CLINKER GRINDER.

Application filed April 12, 1921. Serial No. 460,789.

My invention relates to clinker grinders for mechanical stokers and more particularly to clinker grinders located at the end of a progressive feed grate, and it has for its object to produce an apparatus of the character designated which shall be simple in operation, and rugged in construction and which shall effectively break up clinker and ash before they are discharged into the ash pit.

In the accompanying drawing, the single figure is a diagrammatic view, partially in section, showing an apparatus constructed in accordance with my invention as applied to a stoker furnace.

The efficiency of a mechanical stoker is measured to a large degree by the amount of heat which can be extracted from the fuel supplied to the boiler furnace. The difficulties usually encountered in fuel combustion by mechanical operations are to obtain a complete fuel combustion and a ready disposal of the clinker and ash. Owing to the high ash content of many fuels now on the market, much difficulty has been experienced from the choking up of the ash discharge means, commonly known as "bridging over." Bridging over occurs when molten clinker ash closes over the space between the active grate and the bridge wall. I have discovered that by placing a device constructed in accordance with my invention beneath the discharge end of a mechanical stoker furnace I reduce to a minimum any possibility of bridging over and clogging up of the ash disposal apparatus. I further provide in the ash discharge apparatus additional air supply means whereby all of the fuel is consumed and only ash and clinker are discharged into the ash pit.

Referring to the drawing for a more detailed description of my invention, I indicate a fuel hopper 10 from which fuel is fed into a furnace 11 by a fuel feeding ram 12 operated by a convenient mechanical drive means 13.

During the course of combustion fuel travels over the inclined grate surfaces of the furnace 11 and upon reaching the lower end should be entirely consumed and the ash discharged into a pit 14.

The pit 14 is formed by two converging-diverging side-wall members 15 and 16 which are pivoted at their lower ends at points 17 and 18. The upper portions of the members 15 and 16 are provided with lugs 19 and 20, respectively, to which operating links are secured, as hereinafter more fully described. Located beneath the converging-diverging members 15 and 16 are two toothed rollers 21 and 22 mounted on shafts 23 and 24. The rollers 21 and 22 are spaced relatively closer together than the converging-diverging members 15 and 16 at their position of closest proximity.

The side members 15 and 16 are given relative movement by the stoker drive mechanism 13. A variable throw device 25 of any suitable construction is pivoted to the drive mechanism at 13. A rod 27 is connected to the variable throw device 25 the two forming a link pivoted to a double bell crank lever 28, the latter being oscillatory about a fulcrum member 29 secured to the furnace setting.

In link 26 which connects one arm of the bell crank lever 28 and the lug 19 of the side-wall member 15 is a yieldable device 30 provided with a yieldable means 31 of any well known and suitable construction. A similar yieldable means is placed in link 32.

The lower arm of the bell crank lever 28 is connected to the lug 20 of the side wall member 16 by any suitable arrangement of levers. As shown, a link 32 extends between the lower arm of the bell crank 28 to the lower end of a lever 33 which is fulcrumed at its upper end to the furnace setting as at 34. A link 36 connects the lever 33 to the lug 20.

The arrangement of the operating mechanism above described is preferably such that the side-wall members 15 and 16 are when at their inner positions, in alinement with the furnace side-walls 37 and 38 of the ash discharge parts of the furnace.

During the working down of the clinker and ash through the pit 14, I secure the combustion of any unburned portions of the fuel by providing air ducts 39 in the side wall members 15 and 16 to allow admission of air from suitably arranged air chambers 40 and 41 located at each side of the ash discharge apparatus.

The operation of my invention is as follows:

Fuel is fed into the furnace 11 by means of the feeder mechanism located in the front of the furnace. The fuel travels along the grate surface where the combustible portions are largely consumed. The non-combustible portions of the fuel, especially of fuel hav-

ing high ash content, leaves the rear of the grate in large sheets or masses of fused clinker-ash which are directed into the pit 14 between the oscillating wall members 15 and 16. Here these large masses of clinker-ash are broken up by the inward and outward movement of the side-wall members 15 and 16. It should be noted that the converging-diverging wall members in their inward and outward movement crush any clinker and ash that is too large to pass between the sides. The rollers 21 and 22 beneath the side members are arranged to grind to a requisite fineness all clinker and ash that passes between the side members. The diverging portion of the side members freely admit all material to the grinders and this eliminates all troubles heretofore experienced from clogging up of the clinker grinding apparatus.

During the process of fuel combustion it is obvious that some unconsumed fuel is carried into the ash pit 14 and in many of the installations now in use this unconsumed fuel is passed on into the ash pit as waste. I provide for complete combustion by providing the series of air inlet ports 39 to which air under pressure is supplied by forced draft whereby, during the agitation of the unconsumed fuel and ash in the ash discharge means by movement of the side members, the fuel is entirely consumed thereby obtaining the greatest heat content of the fuel consumed. Again, in using a fuel with a high ash content, large masses of molten clinker ofttimes bridge over the entrance to the ash discharge means and cannot be crushed by the rollers usually provided in such installations, and all clinker and ash is withheld from the crusher. By employing an apparatus constructed in accordance with my invention the sides of which are pivoted at their lower ends and oscillated by links at their top portions such that a relative squeezing motion is imparted to the sides, the clinker and ash coming in contact with the sides are crushed and worked down to the throat of the ash discharge means and any clinker or ash passing the throat will be readily received and crushed to the requisite degree of fineness by the rollers 21 and 22 located below. I further provide for a yieldable means in the operation of the apparatus whereby should any unbreakable substance enter into the pit 14 said means will yield and thereby prevent any serious damage to the primary crushing apparatus. By constructing the apparatus in the form of a converging-diverging pit, the ash and clinker are more readily worked through and all possibilities of clogging heretofore experienced in clinker grinder constructions are avoided.

While I have shown my invention in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various other changes and modifications, without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are imposed by the prior art or as are specifically set forth in the appended claims.

What I claim is:

1. In combination with a mechanical stoker having a drive mechanism and a progressive feed grate, an ash discharge apparatus located beneath one end thereof comprising two oppositely disposed side walls, the walls shaped to form an ash receptacle having a converging-diverging vertical section, and means cooperatively associated with the drive mechanism to impart a relative movement to the side walls of the apparatus.

2. In combination in a progressive feed furnace, a driving mechanism for the progressive feed, an ash discharge apparatus associated with the furnace comprising oppositely disposed converging-diverging walls pivoted at their lower ends, link means operatively connecting with the drive mechanism and the upper portions of said walls, crushing rollers located beneath the movable walls in such a manner that material passing between the walls will fall freely into the crushing rolls.

3. In combination in a boiler furnace, a progressive feed grate, a drive mechanism to feed fuel on the grate, an ash discharge apparatus at the end of the grate comprising two converging-diverging wall members pivoted at their lower ends, means operatively connecting the upper portion of the wall members and the drive mechanism, including a variable throw mechanism and a yieldable connection, and crushing rollers arranged beneath the opening between the wall members, formed by the converging-diverging sides to grind any material passing between the side wall members during their oscillatory movement.

4. In combination with a progressive fuel feed stoker, an ash discharge apparatus comprising a pair of oscillatory side walls, pivotally mounted at their lower ends in opposed, cooperative relation, means actuated by the fuel feed mechanism to oscillate the side walls toward and from each other about their pivots, and crushing rollers mounted beneath said walls to receive ash therefrom.

5. An ash discharging apparatus for stokers comprising a pair of oscillatory side walls, pivotally mounted at their lower ends to form an ash receptacle of variable horizontal section, the horizontal section being reduced intermediate the top and bottom, and means to oscillate said side walls to and from each other about their pivots.

6. An ash discharge apparatus for stokers comprising a pair of oscillatory side walls,

each wall having upper and lower portions disposed in fixed angular relation to form an ash receptacle having a reduced horizontal section intermediate the top and bottom, pivotal supporting means for said walls associated with their lower portions, and means to oscillate the walls to and from each other about said supporting means.

7. An ash discharge apparatus for stokers comprising oscillatory side walls forming an ash receptacle having a throat portion between its top and bottom, means oscillating the walls to and from each other to effect a crushing action, and crushing rolls mounted in spaced relation below the walls a distance apart less than the minimum distance between the walls.

8. In an ash discharge apparatus for stokers, an ash receptacle having a pair of pivotally mounted, spaced apart oscillatory side walls, means for actuating the walls, and crushing rollers mounted beneath said walls to receive ash from the receptacle, said rollers being spaced a distance less than the minimum distance between the walls.

9. In combination with a stoker, an ash receptacle having a restricted section between the top and bottom thereof comprising pivotally mounted converging-diverging oscillatory side walls adapted to receive ash from the stoker, air supplying means in the converging portion of the receptacle, and means for oscillating the walls at a frequency in proportion to the stoker speed.

10. In combination with a stoker, an ash receptacle of converging-diverging section forming a restricted area intermediate the top and bottom thereof having oscillatory side walls pivotally supported in spaced relation to form a crusher, crushing rollers beneath the diverging portion of the receptacle to receive ash therefrom, air supplying means in the converging portion of the receptacle, and means oscillating said walls toward and from each other at a frequency in proportion to the stoker speed.

11. In combination with a stoker having a progressive feed grate, an ash receptacle of converging-diverging section forming a restricted area intermediate the top and bottom thereof having oscillatory side walls adapted to receive ash from the grate in the converging portion thereof, crushing rollers beneath the diverging portion adapted to receive ash therefrom, and means oscillating the walls to and from each other at a frequency in proportion to the stoker speed.

In testimony whereof, I have hereunto subscribed my name this 31st day of March, 1921.

FRANCIS HODGKINSON.