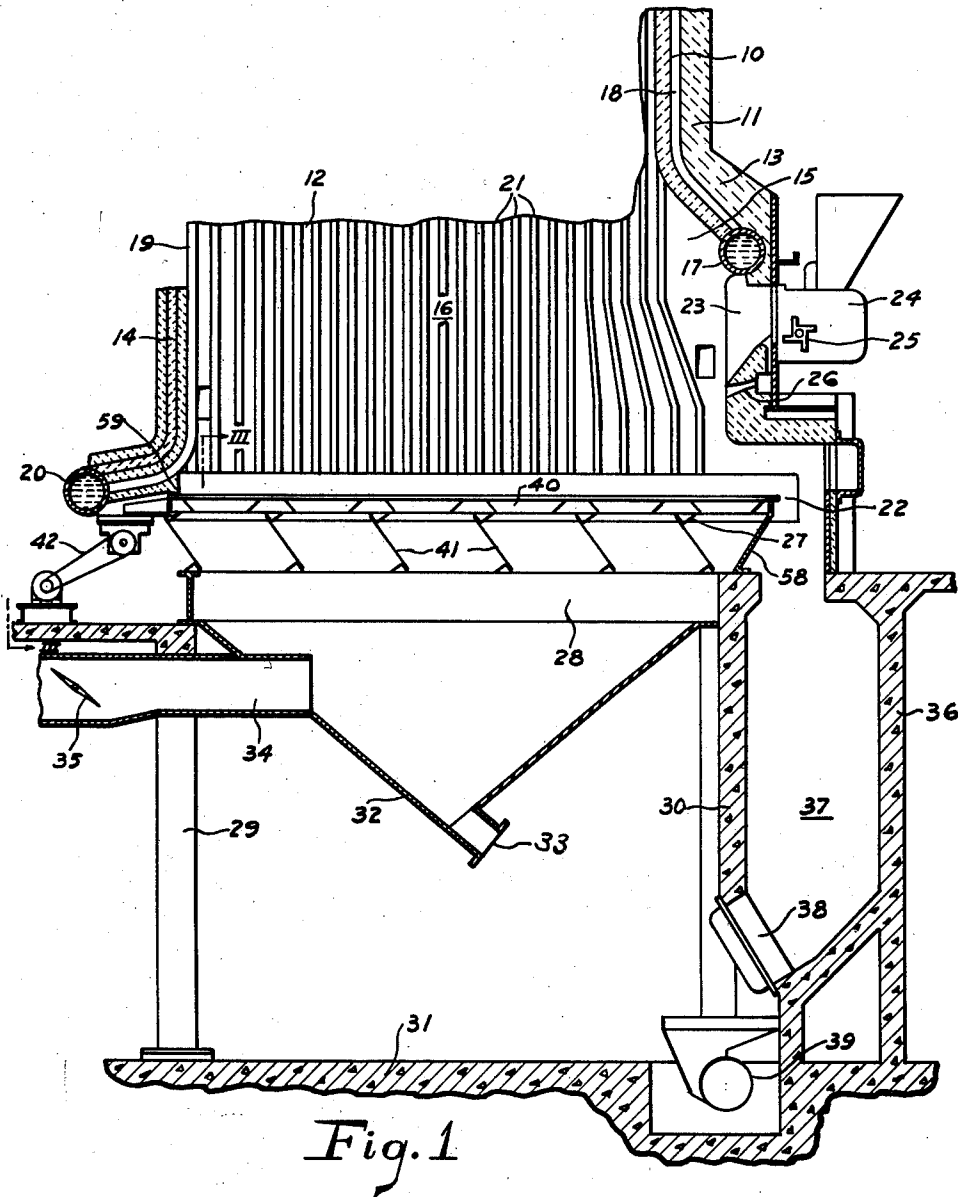


Filed Oct. 5, 1954

FUEL BURNING APPARATUS

2 Sheets-Sheet 1



INVENTOR
OLLISON CRAIG

BY Herman S. Blodgett
ATTORNEY

Aug. 26, 1958

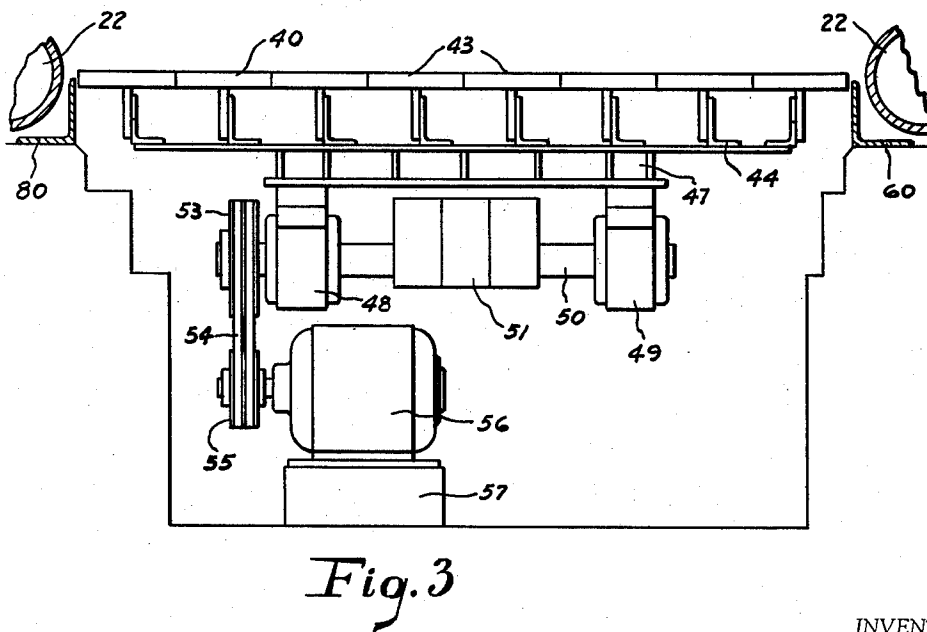
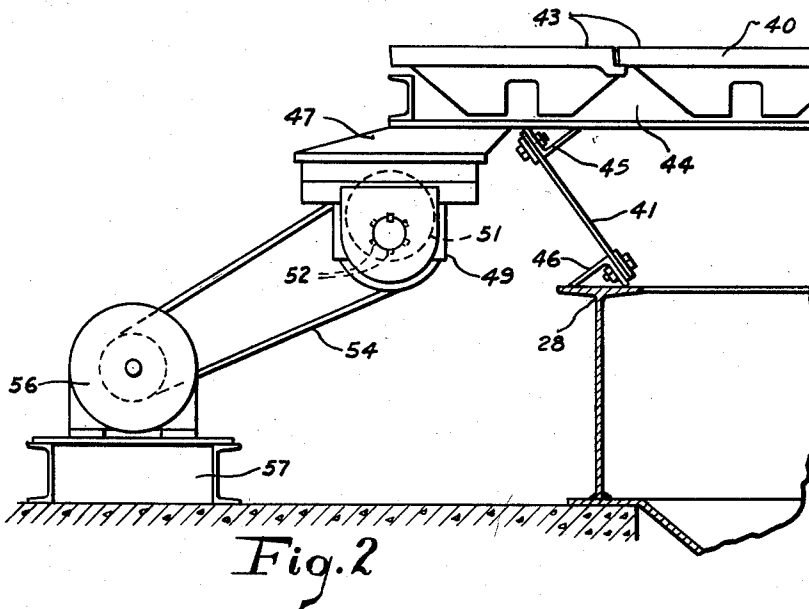
O. CRAIG

2,848,959

FUEL BURNING APPARATUS

Filed Oct. 5, 1954

2 Sheets-Sheet 2



INVENTOR
OLLISON CRAIG

BY *Norman S. Blodgett*
ATTORNEY

1

2,848,959

FUEL BURNING APPARATUS

Ollison Craig, Worcester, Mass., assignor to Riley Stoker Corporation, Worcester, Mass., a corporation of Massachusetts

Application October 5, 1954, Serial No. 460,339

2 Claims. (Cl. 110—38)

This invention relates to fuel burning apparatus, and more particularly to a stoker for use with a steam generating unit.

Among the many means of burning solid fuel, the spreader stoker is perhaps the most versatile. The spreader stoker is particularly useful in the burning of low quality fuels or fuels which for one reason or another are not susceptible of burning by other methods. However, the disposal of the burned out fuel is a problem no matter what type of firing is used, but this problem is even greater in the case of the spreader stoker because of its use with low quality fuels with high ash content, etc. In the past, the grates used with the spreader stoker have been either fixed grates, in which case the fuel is removed by the operator with a hoe or similar tool, the dumping grate, in which construction the fuel is removed by actuating a lever which in turn tips the grates up at an angle so that the bed of ash falls between the grates, or the traveling grate, in which construction the ash is carried by an endless chain grate to one end where the ash falls into an ash pit. All of these methods of firing have disadvantages. The capacity of the fixed grate is limited and the fire is, of course, disturbed when ashes are removed. The dumping grate has the fault that the dumping of a section of the entire grate means an interruption of the firing rate in that portion as well as a baring of the grate elements. The operation of the traveling grate is very satisfactory, but the cost of installation is very high and there is some considerable maintenance involved. These difficulties with prior art devices are obviated in a novel way by the present invention.

It is therefore an outstanding object of the present invention to provide a fuel burning apparatus which is capable of burning low quality fuels and yet is self-cleaning.

Another object of the invention is the provision of a stoker in which the fuel is projected onto the grate and the fuel bed moves progressively to the discharge end of the stoker without excessive agitation which would promote objectionable clinkers and high grate maintenance.

It is another object of the present invention to provide a stoker for burning low quality fuels in which there are no moving parts within the furnace and no lubrication is needed.

It is another object of this invention to provide a spreader stoker which is self-cleaning, but which does not involve a high initial cost or a high cost of maintenance.

Another object of the invention is the provision of an inexpensive stoker that will permit the use of horizontal side water wall headers, thus decreasing the cost of the furnace.

Another object of the invention is the provision of a vibrating grate spreader stoker in which the vibration inducing means is protected from the direct heat of the furnace.

2

With these and other objects in view, as will be apparent to those skilled in the art, the invention resides in the combination of parts set forth in the specification and covered by the claims appended hereto.

The character of the invention, however, may be best understood by reference to certain of its structural forms, as illustrated by the accompanying drawings in which:

Figure 1 is a longitudinal sectional view of a portion of a steam generating unit embodying the principles of the present invention,

Figure 2 is an enlargement of a portion of Figure 1, and Figure 3 is a sectional view taken on the line III—III of Figure 1.

Referring first to Figure 1 wherein is best shown the general features of the invention, a steam generating unit, designated generally by the reference character 10, is shown as comprising a furnace 11 and a boiler 12. The furnace 11 is shown as comprising a front wall 13, and a rear wall 14 which combine with side walls 15 to form a combustion chamber 16. The boiler 12 consists of a header 17 serving front wall tubes 18, rear wall tubes 19 served by a header 20 and side wall tubes 21 served by a horizontal header 22. An opening 23 is provided in the front wall 13 of the furnace 11 and on the outer surface of the wall overlying this opening is a spreader stoker 24 of the type shown and described in the patent to Miller, No. 2,538,944, issued on January 23, 1951. The spreader stoker 24 includes a rotary distributor 25 mounted on a transverse axis. Immediately under the opening 23 in the wall 13 is an overfire air nozzle 26.

Underlying the combustion chamber 16 on a level with the header 22 is a vibrating grate 27. This grate is mounted on girders 28 which are mounted on abutments 29 and 30 extending upwardly from a foundation 31. Underlying the vibrating grate 27 and the girders 28 is a plenum chamber 32 having an access door 33. An air duct 34 having a control damper 35 extends into the plenum chamber. The front wall 13 of the furnace is mounted on an abutment 36 extending upwardly from the foundation 31 and between the abutment 36 and the abutment 30 is situated an ash pit 37 having an exit door 38 in its lower portion, there being an ash disposal means 39 situated under the door 38.

The vibrating grate 27 consists of a table-like surface element 40 supported on flexure plates 41 and having connected thereto at its rearward end a vibratory means 42. Referring to Figures 2 and 3, the surface element 40 consists of grate clips 43 fixedly attached to a framework 44 made up of steel girders and channel members. The surface element extends from side to side of the furnace and its side edges are on a level with the center lines of the headers 22 and adjacent to the outer periphery thereof. Each flexure plate 41 is bolted at its upper end to a supporting block 45 fastened to the lower surface of the surface element 40 and at its lower end to a supporting block 46 fastened to the upper surface of the girders 28. To the rearward end of the surface element 40 of the grate is fastened a support 47 to the lower surface of which are attached two pillow blocks 48 and 49 having the shaft 50 journaled therein. To the central portion of the shaft 50 is keyed a series of eccentrics 51. These eccentrics are provided with a number of keyways 52 spaced around the central bore thereof so that the phasing of the eccentrics may be varied relative to one another. At one end of the shaft 50 at a position outboard of the block 48 is mounted a pulley 53 which is operatively connected through drive belts 54 to a pulley 55 on the shaft of a motor 56 which is mounted on a support 57.

A suitable seal plate 58 joins the upper forward portion of the plenum chamber 32 to the forward edge of the surface element 40. A sliding seal 59 extends downwardly

3

from the rear wall 14 toward the rearward portion of the element 40. At the sides the element 40 resides adjacent angle irons 60, as shown in Figure 3. In this way, leakage of air around the grate is reduced to a minimum.

The operation of the apparatus will now be clearly understood in view of the above description. Water is delivered to the headers 17, 20, and 22 for flow through the tubes 18, 19, and 21 in the usual manner. Solid fuel is delivered to the spreader stoker 24 and is thrown by the distributor 25 through the opening 23 onto the vibrating grate 27. The finer particles in the fuel burn in suspension and never reach the grate. The heavier particles land on the grate and form a fuel bed. The energization of the motor 56 causes the rotation of the shaft 50 through the pulleys 55 and 53 and the belt 54. Since the surface element 40 of the grate 27 is fully mounted on the flexure plates 41, it will begin to vibrate according to the rate of rotation and the adjustment of the eccentrics 51. An additional factor in the rate of vibration of the grate of course will be the vibratory characteristics of the grate itself, and, more particularly, its resonant frequency. The fuel bed will move toward the front of the furnace and the burned-out fuel will gradually be discharged into the ash pit 37. Due to the nature of the vibratory grate, there will be no shifting of ash particles and fuel particles relative to one another and thus no stirring of the fuel bed which would otherwise bring about clinkering. Furthermore, there is no necessity for the grate to be inclined to promote movement of the fuel, so that horizontal headers may be used, thus permitting the furnace construction to be inexpensive.

It is obvious that minor changes may be made in the form and construction of the invention without departing from the material spirit thereof. It is not, however, desired to confine the invention herein shown and described, but it is desired to include all such as properly come within the scope claimed. The invention having thus been described, what is claimed as new and desired to secure by Letters Patent is:

1. A fuel burning apparatus for use in a steam generating unit comprising a furnace mounted on a supporting foundation and having an arch located in the lower portion thereof, a grate having a substantial horizontal flat surface extending throughout the bottom of the furnace, means for introducing fuel to the grate, means for mounting the grate for vibratory movement to cause the fuel to move from one end to the other of the grate, the last-named means including flexure plates lying in parallel planes extending transversely to the direction of movement of the fuel and being inclined to the surface of the grate, the flexure plates being fastened at their upper ends to the grate and at their lower ends

4

to the support and consisting and constituting substantially the entire support of the grate, the plates offering more resistance to horizontal motion away from a position of rest than in returning to the said position, a shaft rotatably mounted on the grate having its axis parallel to the surface of the grate and to the planes in which the flexure plates lie, eccentrics carried by the shaft for imparting substantially horizontal vibratory motion to the grate whereby fuel falling on the grate is ultimately burned to ash and moved along the grate, and a motor mounted on the foundation and connected by a flexible drive to the eccentrics, the eccentrics being rotated freely in space out of contact with the grate, the motor and eccentrics being located under the furnace arch and being shielded thereby from radiation from the furnace.

2. A fuel burning apparatus for use in a steam generating unit comprising a furnace mounted on a supporting foundation and having an arch located in the lower portion thereof, a grate having a substantially horizontal flat surface extending throughout the bottom of the furnace, means for introducing fuel to the grate, means for mounting the grate for vibratory movement to cause the fuel to move from one end to the other of the grate, the last-named means including flexure plates lying in parallel planes extending transversely to the direction of movement of the fuel and being inclined to the surface of the grate, the flexure plates being fastened at their upper ends to the grate and at their lower ends to the support and constituting substantially the entire support of the grate, the plates offering more resistance to horizontal motion away from a position of rest than in returning to the said position, a shaft rotatably mounted on the grate having its axis parallel to the surface of the grate and to the planes in which the flexure plates lie, eccentrics carried by the shaft for imparting substantially horizontal vibratory motion to the grate whereby fuel is ultimately burned to ash, a motor mounted on the foundation and connected by a flexible drive to the eccentrics, the eccentrics being rotated freely in space out of contact with the grate, and means whereby the motor and eccentrics are shielded from radiation from the furnace.

References Cited in the file of this patent

UNITED STATES PATENTS

1,127,940	Stevens	Feb. 9, 1915
1,939,177	Losch	Dec. 12, 1933
2,008,648	Symons	July 16, 1935
2,119,554	Marty	June 7, 1938
2,763,220	Becker	Sept. 18, 1956

FOREIGN PATENTS

574,829	Great Britain	Jan. 22, 1946
---------	---------------	---------------