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PREHEATER WASHING DEVICE

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Fig. 1

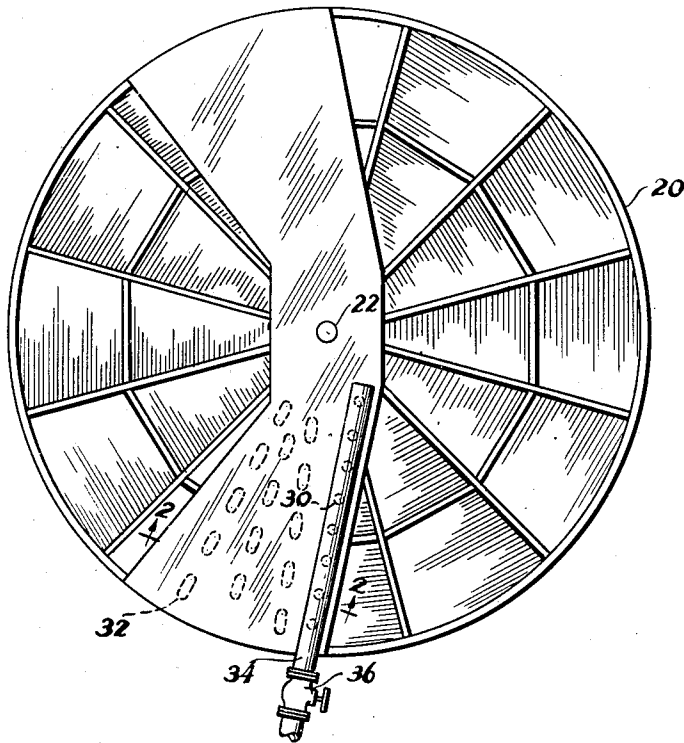
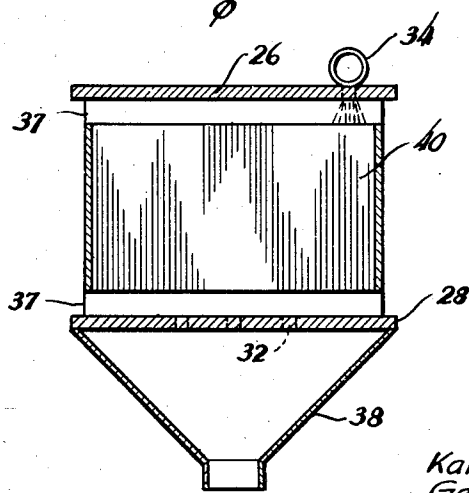


Fig. 2



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PREHEATER WASHING DEVICE

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7 Claims. (Cl. 257—1)

This invention relates generally to regenerative heat exchanging apparatus and particularly to an improved device for cleaning the regenerative heat exchanger plates of such an apparatus.

In a rotary regenerative air preheater the heat transfer surface consists of spaced metallic plates mounted in a rotor which is turned first into the path of gases to absorb heat therefrom and then into an air stream to impart heat thereto.

An important drawback accompanying the operation of most modern boiler plants is the fouling of the heating element in the air preheaters by ash and other products of combustion, which under certain firing conditions rapidly clog up the air passageways between plates until the efficiency of the preheater is greatly lowered. Usually a build-up of deposits necessitates a shut down of the plant and removal of the heating elements for cleaning and treating with a chemically active solution which provides a deterrent to further deposits. In some preheaters a system of pipes and baffles has been utilized to effect a washing operation within the preheater housing without removing the elements from the housing, however, such systems usually require a complex arrangement of gears and mechanical linkages which are expensive to produce and difficult to maintain.

The present invention dispenses with the usual complex mechanical linkages and gear trains and provides a unique arrangement of slotted sector plates and headers to effect an efficient distribution of the cleaning fluid.

The present invention may be better understood upon consideration of the following detailed description of an illustrative embodiment thereof when read in conjunction with the accompanying drawings in which:

Figure 1 is a plan view of a rotor for a regenerative type air preheater showing a sector plate equipped with a water washing apparatus embodying the present invention.

Figure 2 is a side elevation of the rotor as seen on line 2—2 of Figure 1.

The apparatus comprises a rotor, designated as a unit by the numeral 20, revolving about an axis of rotation 22. Positioned axially at both ends of the rotor are upper and lower end or sector plates 26 and 28, respectively, which provide structure housing the washing apparatus of this invention.

The sector plate 26 located above the rotor has a series of evenly spaced ports 30 adjacent its leading edge to provide points of ingress for a cleaning fluid being supplied to the rotor. The ports are radially spaced to provide an even distribution of fluid to the entire surface of the rotor and are connected to a header 34 which is connected to an outside source of cleaning fluid. The header illustrated has a constant diameter from its radially outer to its radially inner extremities, however, under certain conditions depending upon size of unit, frequency of operation or fluid used, it may be desirable to taper the header whereby the diameter decreases progressively toward its inner end. Fluid flow through the header is

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positively controlled by a valving means 36 which is operated manually or by automatic means not illustrated.

The lower sector plate 28 has a plurality of radially disposed slots 32 which are adapted to receive the effluent comprising deposits which are removed from the rotor together with the washing fluid supplied through the ports 30. Radial seals 37 are fixed to radial diaphragms 40 to rotate with the rotor and bridge the space between the rotor and sector plates. The seals 37 provide a pushing and scraping action which is instrumental in forcing the washing fluid and entrained deposits into the slots 32 and thence to the hopper 38 where they are collected before being carried off for disposal.

In operation a cleaning fluid is supplied to the header through a conduit controlled by the valve 36. Fluid supplied to the header is then distributed through the ports 30 to the rotor where it flows downwardly over the heating elements of the rotor to wash away products of combustion which have become attached to the surfaces thereof. When the cleaning fluid and entrained deposits reach the lower sector plate 28 they are pushed and scraped through the slots 32 by the radial seals 37 which are fixed to the diaphragm and rotate with the rotor. All cleaning fluid and deposits are then collected in a hopper 38 positioned beneath the lower sector plate and from this hopper the fluid and deposits are drained away to be disposed of in any suitable manner.

Under certain operating conditions it may be desirable to chemically treat the cleaning fluid with an alkali solution prior to its introduction into the rotor. Under these conditions, the washing apparatus of this invention may be readily modified to allow an introduction of cleaning fluid prior to its admittance into the header. However, such modification constitutes no part of this invention.

What we claim is:

1. A regenerative heat exchange apparatus having a cylindrical housing formed with parallel passageways for hot gases and air, a rotor concentrically aligned within said housing carrying heat transfer elements into the gas passageway to absorb heat therefrom and thence into the air passageway to impart heat thereto; upper and lower sector plates attached to opposite ends of the housing, said sector plates having openings laterally spacing the air and gas passageways; a series of radially spaced ports in the upper sector plate adjacent a leading edge thereof; a plurality of radially disposed slots arranged in the lower sector plate to receive fluid having ingress through the ports in the upper sector plate; means for supplying a cleaning fluid to the radially spaced ports in the upper sector plate; and means carried by the rotor adapted to wipe against the lower sector plate.

2. A regenerative heat exchange apparatus having a cylindrical housing formed with parallel passageways for hot gases and air, a rotor concentrically aligned within said housing carrying heat transfer elements into the gas passageway to absorb heat from the gas passing there-through, and then into the air passageway to impart heat to the air flowing therethrough, upper and lower sector plates attached to opposite ends of the housing, said sector plates having openings interposed in the air and gas passageways; a row of radially spaced ports adjacent an edge of the upper sector plate; rows of radially disposed slots in the lower sector plate circumferentially displaced from the ports in the upper sector plate; means for supplying a washing fluid to the radially spaced ports; and means carried by the rotor adapted to wipe against the lower sector plate.

3. In a regenerative heat exchange apparatus having a housing formed with passages for a heating gas and air to be heated; a rotor carrying regenerative heat transfer plates into the gas passageway to absorb heat from

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the gas flowing therethrough and then into the air passageway to impart heat to the air flowing therethrough; aligned sector plates at each end of the rotor having a plurality of openings for the countercurrent flow of gas and air, the upper sector plate including a series of radially disposed ports adjacent a leading edge thereof and the lower sector plate including rows of radially disposed slots circumferentially displaced from the series of ports in the upper sector plate; a heater for supplying fluid to the series of radially disposed ports; and means carried by the rotor adapted to wipe against the lower sector plate.

4. In a regenerative heat exchange apparatus having a cylindrical housing formed with passages for a heating gas and air to be heated; a rotor carrying regenerative heat transfer plates into the gas passageway to absorb heat from the gas flowing therethrough and then into the air passageway to impart heat to the air flowing therethrough; aligned sector plates at opposite ends of the rotor having openings for the counter-flowing gas and air; a series of radially disposed ports adjacent a leading edge of the upper sector plate; rows of radially extending slots in the lower sector plate; radially extending sealing means carried by the rotor adapted to wipe against the lower sector plate; and a hopper means depending from the slotted portion of the lower sector plate whereby fluid admitted to the rotor through ports in the upper sector plate may flow over the heat transfer plates of the rotor and out the slots in the lower sector plate to be collected in the hopper.

5. In a regenerative heat exchange apparatus having a cylindrical housing formed with passages for a heating gas and counterflowing air to be heated; a rotor within said housing carrying regenerative heat transfer plates into the gas passageway to absorb heat from gas flowing therethrough and thence into the air passageway to impart heat to the air flowing therethrough; aligned sector plates on the housing at opposite ends of the rotor, each sector plate having openings for the counterflowing gas and air; a series of radially disposed ports adjacent a leading edge of the upper sector plate; rows of radially extending slots in the lower sector plate; a manifold connecting the ports in the upper sector plate to a source of cleaning fluid; radially extending sealing and wiping means carried by the rotor adapted to force the cleaning fluid through the radially extending slots in the lower sector plate; and hopper means depending from the slotted portion of the lower sector plate whereby fluid admitted through the manifold on the upper sector plate may flow downwardly over the heat transfer plates in the rotor and

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thence out the slots in the lower sector plate to be collected in the hopper fixed thereto.

6. In a regenerative heat exchange apparatus having a cylindrical housing formed with passages for heating gas and counterflowing air to be heated; a rotor within said housing carrying regenerative heat transfer plates into the gas passageway to absorb heat from the gas flowing therethrough and thence into the air passageway to impart heat to the air flowing therethrough; upper and lower sector plates connected to the cylindrical housing at opposite ends of the rotor, each of said sector plates having openings for the counterflowing gas and air; a series of ports arranged radially along a leading edge of the upper sector plate; rows of radially extending slots in the lower sector plate displaced from a plane normal to the series of ports in the upper sector plate; a manifold connecting the ports in the upper sector plate to a source of cleaning fluid; sealing means carried by the rotor adapted to wipe against the lower sector plate and a hopper depending from the slotted portion of the lower sector plate whereby fluid flowing over the heat transfer plates to the lower sector plate is drained through the radially extending slots into the affixed hopper.

7. A regenerative heat exchange apparatus having a cylindrical housing formed with parallel passageways for hot gases and air, a rotor concentrically aligned within said housing carrying heat transfer elements into the gas passageway to absorb heat therefrom and thence into the air passageway to impart heat thereto; upper and lower sector plates attached to opposite ends of the housing, said sector plates having openings laterally spacing the air and gas passageways; a series of radially spaced ports in the upper sector plate adjacent a leading edge thereof; a plurality of radially disposed slots arranged in the lower sector plate to receive fluid having ingress through the ports in the upper sector plate; and means for supplying a cleaning fluid to the radially spaced ports in the upper sector plate; and radially extending sealing members carried by the rotor at its lower end wiping against said lower sector plate.

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