Oct. 16, 1956 R. S. COOPER ET AL 2,766,969

INTER-DECK SOOT BLOWER

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Fig. 1

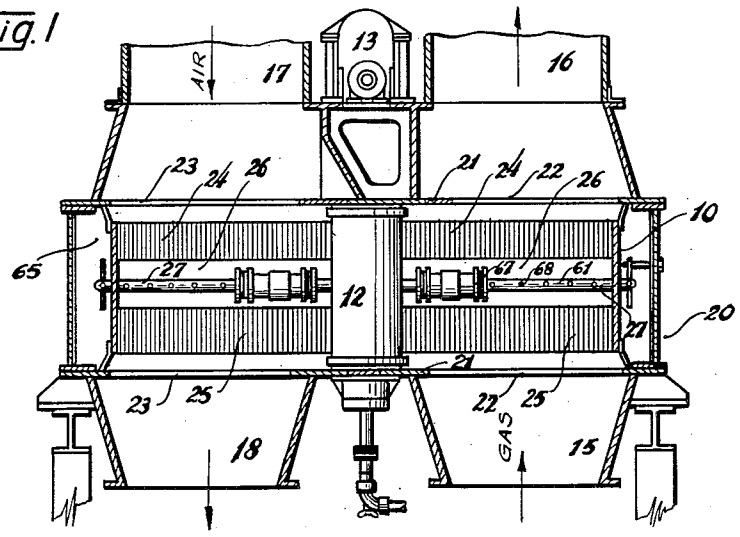
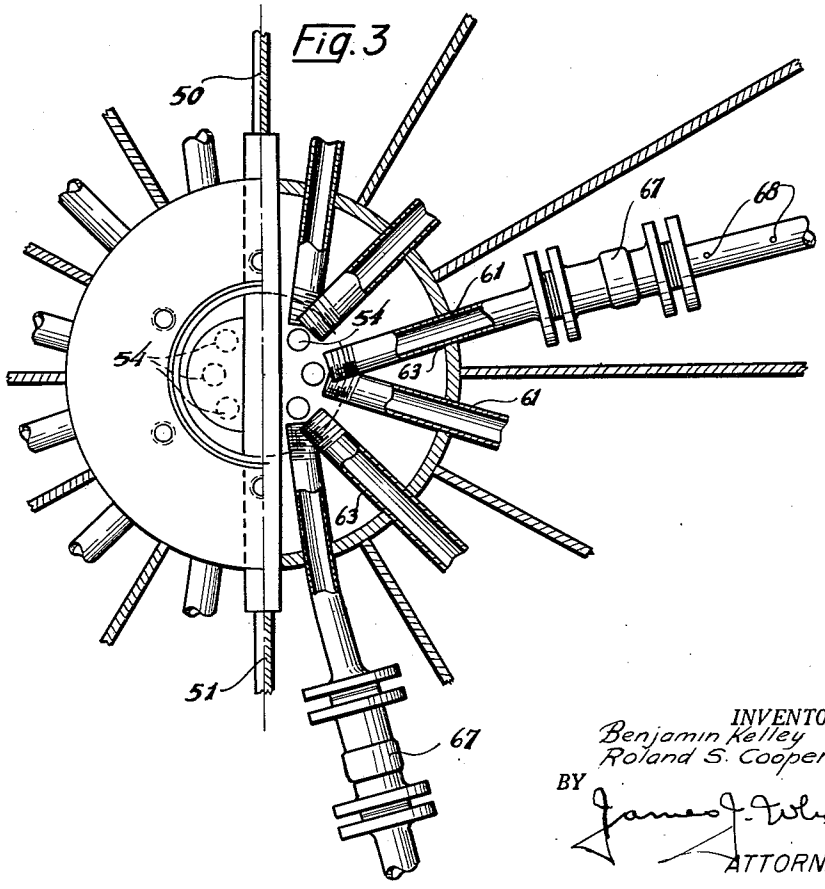


Fig. 3



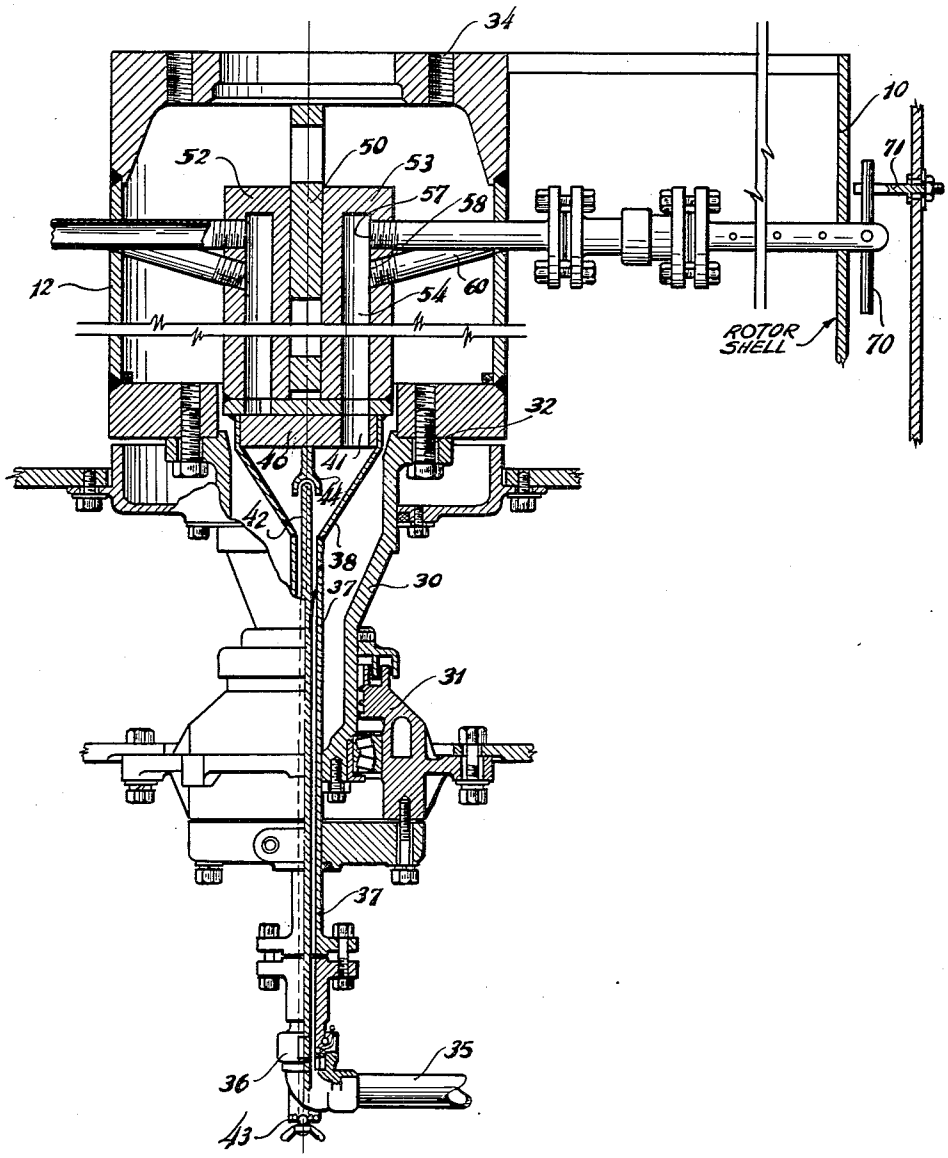
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Fig. 2



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INTER-DECK SOOT BLOWER

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8 Claims. (Cl. 257—1)

This invention relates to heat transfer apparatus of the regenerative type and more particularly to an improved means for removing soot and other deposited matter from the heat exchange surfaces in the rotor of an air preheater.

In a regenerative air preheater, metallic heat transfer plates which are carried in compartments of a rotor absorb heat which passes through the gas side of the preheater. On rotation of the rotor, said plates yield their heat to cool air which flows in countercurrent relation through the air side of the preheater. Fly ash and soot which are carried by the hot furnace gases tend to deposit on the plates within the compartments thereby obstructing flow of the gases and necessitating frequent cleaning.

It is therefore an object of this invention to provide an improved device which will effectively remove the deposits of soot and fly ash from the heat exchanger plates of a rotary air preheater.

It is a further object of our invention to provide for a cleaning device which rotates between "decks" of heat exchange elements so as to more effectively clean all surfaces above and below the cleaning device.

The invention will best be 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 sectional elevation of a rotary air preheater showing the interdeck soot blowers in position.

Figure 2 is a sectional side elevation on a larger scale, taken through the rotor post.

Figure 3 is a large scale plan view partly in section showing the connection of the soot blower pipes to the steam supply.

In Figure 1 of the drawings the numeral **10** designates the cylindrical shell of a rotor that is divided into sector shaped compartments by radial partitions connecting it with the rotor post **12** which is driven by a motor through reduction gearing **13** to turn the rotor slowly about its axis. The rotor compartments contain regenerative heat transfer material in the form of metallic plates which first absorb heat from hot gases entering the preheater through a duct **15** from a boiler or other source to be discharged after passing over the heat transfer plates through an outlet duct **16** to which an induced draft fan (not shown) is connected. As the rotor turns slowly about its axis, the heated plates are moved into the stream of air admitted through the duct **17** to which a forced draft fan (not shown) is connected. After passing over the heated plates and absorbing heat therefrom the stream of air is conveyed to the boiler furnace or other place of use through duct **18**. A housing **20** enclosing the rotor **10** is provided at either end opposite the latter with end or sector plates **21** which are apertured at **22** and **23** to permit streams of gas and air to enter and leave the preheater.

The mass of heat transfer surface consisting of the metal plates carried by the rotor **10** is in accordance with the invention divided into an upper and a lower layer **24, 25** respectively or two "decks" separated by an interdeck space **26** in which is mounted a pressure jet fluid-cleaning device designated as a whole by **27**.

The cleaners or soot blowers of the present invention have been designed with the object of applying them to existing air preheaters with a minimum of alteration. Similar cleaners could readily be adapted to new construction.

In Figure 2 the cleaning device **27** has been shown as applied to an existing preheater in which **30** indicates the lower trunnion terminating in the guide bearing **31**. The lower trunnion is bolted as at **32** to the rotor post **12**. The rotor is turned by conventional means connected to an upper support trunnion, the upper support trunnion is in turn joined to the upper portion of the rotor post **33** by bolts through openings **34**. A supply pipe **35** leads to the rotatable joint **36** which is connected via pipe **37** to the funnel shaped member **38**. Said member **38** serves as a housing for an admission port block **40** which contains an arcuate opening **41**. Connected to the admission port block **40** by means of rod **42** is a locking member **43**. This member is manually rotatable and serves to lock the admission port block **40** in a single position. In this way, steam or other cleaning fluid which is supplied through pipe **35** can be directed to either the air side or the gas side of the rotor by shifting port **41** from one side to the other. Rod **42** is connected to the admission port block **40** through a universal joint **44**.

Located within the rotor post **12** and joined to either side of its two dividing plates **50** and **51** are two semi-cylindrical forgings **52** and **53**. Each of these forgings contains three passageways **54** which extend parallel to the axis of the rotor post. These passageways are selectively open or closed at their bottom ends to the arcuate port **41** in the admission port block **40**. The upper portion of each passageway has two openings **57, 58** each of which extends radially toward an opening **39** in the rotor post. Extending through each opening **61** in the forgings **52** and **53** are soot blower pipes **63**. Each of such pipes extends radially through the opening **61** in the rotor post and through openings **64** (Fig. 2) in the rotor shell **10**, terminating in the annular space **65** between the rotor shell and the rotor housing **20**.

Separating each soot blower pipe into a radially inner and outer portion is a rotary joint **67** which makes the outer portion rotatable with respect to the inner portion. Each soot blower pipe is closed at its distal end and has a series of emission ports **68** located along said pipe.

Welded or otherwise joined to the end of each blower pipe **61** in the space **65** are a plurality of pins **70** which may form a star-wheel. On rotation of the preheater rotor **10** and soot blower pipes **61** carried thereby, each of the pins **70** successively contacts one of a plurality of pins **71** which extends inwardly from the rotor housing **43**, thus rotating the outer portion of each soot blower pipe. The frequency of rotation of the soot blower pipes is dependent upon the relative number of pins **70** and **71**.

In operation, the admission port block **40** is rotated and locked into position by the admission port locking device **43** with port **41** registering with the air at the gas side. Steam or pressurized air for soot blowing purposes is admitted via supply pipe **35** and pipe **37** to the chamber inside conical member **38**. There the steam is supplied successively to the rotary ports **54** by the stationary arcuate port **41**.

The rotor post **10** with its forgings **52** and **53** contains parallel passageways **54** which rotate with respect to the admission port block **40**. Consequently, only when port **41** registers with one of the passageways **54** will there be a supply of steam to the corresponding pair of soot blowing pipes **61**.

When steam is supplied to one of the passageways **54** and its corresponding two blower pipes **61**, there is an

emission of steam through the ports 68 of the pipe. As the rotor revolves about its axis, the pins 70 and 71 cooperate to revolve outer ends of pipes 61 so as to direct the cleaning steam into both upper and lower decks of heat exchange elements.

What we claim is:

1. In a regenerative type of air preheater having a housing formed with parallel passages for the countercurrent flow of hot gases and air; a rotor in said housing, said rotor being divided into upper and lower layers of heat exchange elements supported by a central rotor post; and a plurality of pipes extending radially from the rotor post between the layers of heat exchange elements for the supply of cleaning fluid thereto.

2. In a regenerative type air preheater having a housing formed with parallel passages for the countercurrent flow of hot gases and air; a rotor in said housing, said rotor being divided into an upper and lower layer of heat exchange elements supported from a central rotor post; a plurality of pipes extending radially from the rotor post through the space between layers of heat exchange elements; and means for supplying washing fluid to the radially extending pipes during rotation of the rotor.

3. In a regenerative type of air preheater having a housing formed with parallel passages for the countercurrent flow of hot gases and air; a rotor in said housing, said rotor being divided into upper and lower layers of heat exchange elements, each of which are supported by a central rotor post to provide a space therebetween; a plurality of ported pipes extending radially from the rotor post into the space between upper and lower layers of heat exchange elements; and means allowing for a free rotation of the outer end portion of each radially extending pipe.

4. In a regenerative type of air preheater having a housing formed with parallel passages for the countercurrent flow of hot gases and air; a rotor in said housing, said rotor being separated into an upper and lower layer of heat exchange elements supported from a central rotor post; a plurality of ported blower pipes extending radially from the rotor post through the space between layers of heat exchange elements; means for each pipe which allows for a free rotation thereof; and means to supply fluid to the radially extending pipes during rotation of the rotor.

5. In a rotary regenerative type air preheater having a housing formed with parallel passages for the countercurrent flow of hot gases and air; an inner rotor shell concentric with said housing carrying an upper and a lower layer of heat exchange elements supported from a central rotor post; a plurality of ported blower pipes extending radially from the rotor post into the space between said rotor shell and rotor housing; and means permitting rotation of each blower pipe about its longitudinal axis so as to effectively supply a cleaning fluid to the heating elements positioned both above and below said blower pipes.

6. In a rotary regenerative type air preheater having a housing formed with parallel passages for the countercurrent flow of hot gases and air therethrough; a rotor shell concentrally positioned within said housing carrying spaced upper and lower layers of heat exchange elements supported from an axial rotor post; a plurality of circumferentially positioned longitudinally ported blower pipes extending radially outward from said rotor post into the space between said upper and lower layers of heat exchange elements; rotatable joints in each blower pipe permitting rotation of the outward portion thereof; and valving means in said rotor post supplying fluid to the radially extending pipes during rotation of the rotor.

7. A rotary regenerative air preheater having a housing formed with parallel passages for the countercurrent flow of hot gases and air therethrough; a rotor shell concentric within said housing carrying spaced upper and lower layers of heating elements; a plurality of ported blower pipes extending radially outward from the rotor post through circumferentially spaced openings in the rotor shell and terminating in the annular space between the concentric rotor shell and rotor housing; rotatable joints in each blower pipe permitting rotation of the outer portion thereof; and means positioned in said annular space for rotating each blower pipe about its longitudinal axis.

8. An air preheater according to claim 7 wherein the means rotating each blower pipe about its axis comprises a star wheel at the end of each blower pipe cooperating with pin means projecting inwardly from the rotor housing.

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