

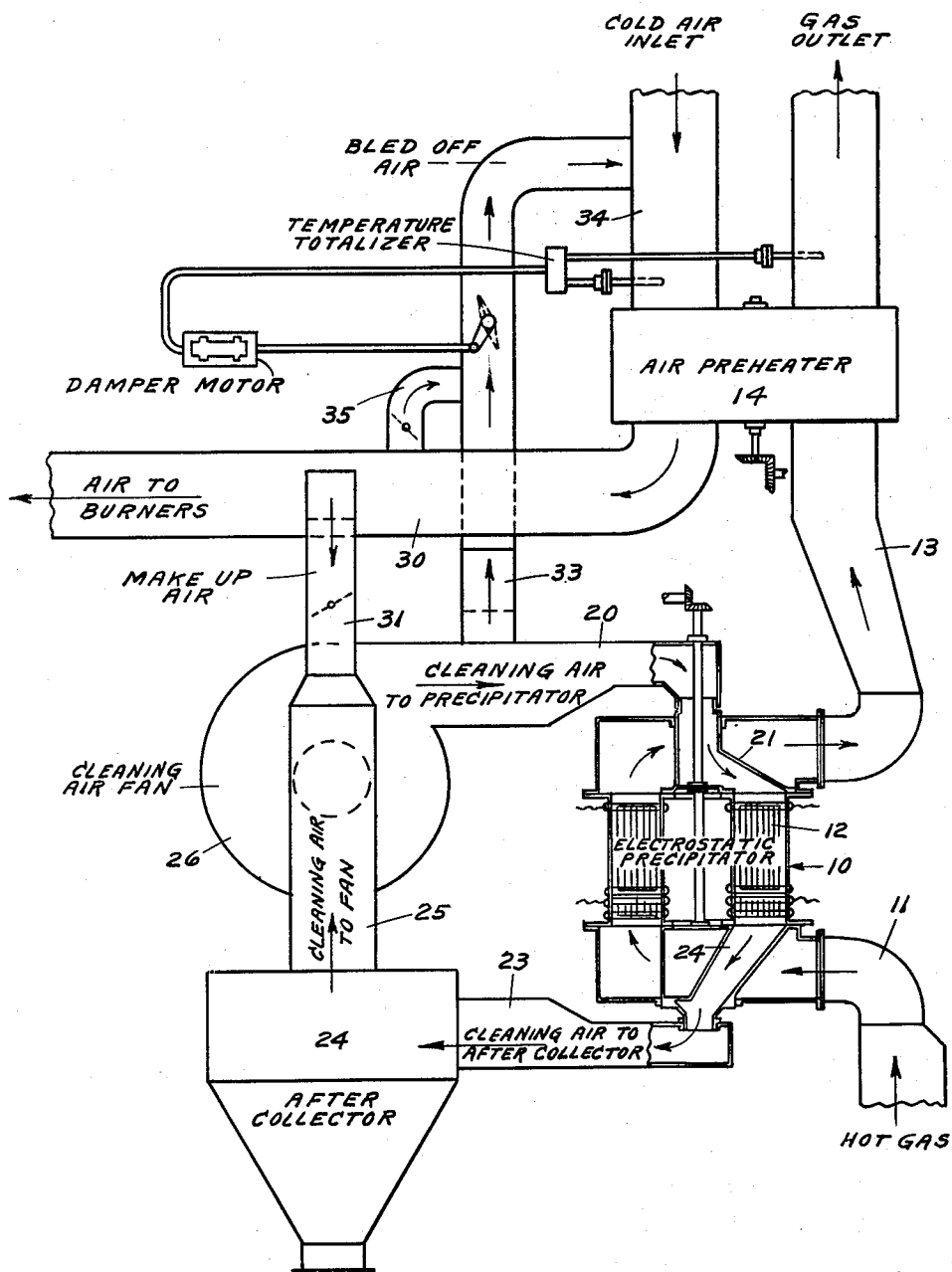
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RECIRCULATION OF CLEANING AIR IN PRECIPITATOR

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RECIRCULATION OF CLEANING AIR IN PRECIPITATOR

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6 Claims. (Cl. 183—7)

The present invention relates to gas cleaning and more particularly to an improved system utilizing an electrostatic precipitator.

In the Karlsson patent, No. 2,582,133 issued January 8, 1952, there is disclosed an electrostatic precipitator in which dust-laden gases are passed over charged electrodes which are continuously cleaned by a stream of air or other fluid by means of a cleaning apparatus which moves relatively to the bank of collecting electrodes. The efficiency of such precipitators is dependent upon maintaining the dust particles at a high temperature to avoid moisture pickup. To attain this end the present invention contemplates that the stream of cleaning air be maintained at a desired high temperature. The invention further contemplates that the volume of pressurized cleaning air be continuously recirculated through the precipitator and an "after collector" where dust blown from the precipitator electrodes is removed before return of the cleaning air to the precipitator. To avoid a dust build-up in the cleaning air stream, the invention also contemplates that a portion of the cleaning air be bled off and replaced by fresh heated air which serves to maintain the desired temperature for the stream of cleaning air.

The invention will be best understood upon consideration of the following detailed description of an illustrative embodiment thereof when read in conjunction with the accompanying drawings in which the single figure is a diagrammatic representation of a system for cleaning dust-laden gases in which the present invention is embodied.

In the drawing, the numeral 10 designates an electrostatic precipitator through which dust-laden gases as from a furnace are introduced through the duct 11 and wherein the charged electrodes 12 remove the dust particles before the stream of hot gases in discharged through the duct 13 to pass through the gas side of a rotary regenerative air preheater 14. According to the present invention the dust particles deposited on the collecting surfaces are blown off by a stream of high velocity hot air which enters the precipitator through the duct 20 and is fed to a rotary nozzle arrangement 21 with the dust particles that are removed being discharged into a hopper 22 and passed through a duct 23 to a cyclone type after-collector 24 wherein the dust particles carried by the cleaning air stream are disentrained. The cleaned hot air is drawn from the after-collector 24 through a duct 25 by fan 26 whose outlet supplies the duct 20 leading to the precipitator, the arrangement described thus forming a closed circuit. To maintain the stream of cleaning air entering the precipitator at the desired high temperature, a fresh supply of clean hot air is taken from the air outlet duct 30 of the rotary air heater 14 and supplied to the inlet of fan 26 through the duct 31. In order to maintain a substantially constant volume of recycled cleaning air flowing through the ducts 20 and 23, it is necessary to remove an amount commensurate with that which enters the system through the duct 31. For this purpose a duct 33 connecting into duct 20 bleeds off a small volume of air and carries it to the air inlet duct 34 of the air heater 14 where it serves to raise the temperature of the cold entering air sufficiently to assist in protecting the elements of the air heater 14 by minimizing condensation on the elements at the cold end of the preheater and thus prevent deposit of moisture from the gas stream which would tend to induce the collection of undesirable deposits from the gases. Hot air recirculating duct 35

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connected between ducts 30 and 33 provides a further means of raising the temperature of air entering the preheater.

The continuously cleaned precipitator is purged of deposits by a high velocity stream of air which moves with relation to the collecting surfaces and both removes the collected dust and transports it out of the unit and into the after-collector where it is removed. The success of the precipitator depends on keeping the dust at a high temperature to avoid moisture pick up so it is desirable to avoid any drop in temperature such as might result if air at a lower temperature were used.

The system disclosed herein uses a closed cleaning cycle with a constant volume of cleaning air being continuously recirculated through the precipitator 10 by its own fan. However, since the after-collector 24 is not 100% efficient on small particles, a dust buildup would take place in the cleaning air stream. To avoid this, a small portion of additional or make up air is led from the secondary air duct to the cleaning fan inlet and an equal portion is bled from the fan discharge. All or a portion of this bled off air may be reintroduced before the air preheater where it raises the air inlet temperature and protects the cold end of the preheater.

What I claim is:

1. A gas cleaning system comprising; an electrostatic precipitator interposed in a duct carrying particle-laden hot gases; continuously operating means utilizing a stream of air for cleaning separated particles from the collecting surfaces of the precipitator and conveying them from the latter; an after-collector for removing the carried particles from the air stream; a fan for withdrawing the cleaned air from said after-collector and recirculating it through said precipitator, said precipitator, after-collector and fan being interconnected to form a closed circuit; an air heater; means for taking heated air from said air heater and mixing it with the stream of cleaned air before reintroduction of the latter into said precipitator.

2. A gas cleaning system comprising; an electrostatic precipitator interposed in a duct carrying particle-laden hot gases; continuously operating means utilizing a stream of air for cleaning separated particles from the collecting surfaces of the precipitator and conveying them from the latter; an after-collector for removing the carried particles from the air stream; a fan for withdrawing the cleaned air from said after-collector and recirculating it through said precipitator, said precipitator, after-collector and fan being interconnected to form a closed circuit; an air heater; means for taking heated air from said air heater and mixing it with the stream of cleaned air before reintroduction of the latter into said precipitator; and means for bleeding a determined volume of cleaned air from said closed circuit.

3. A gas cleaning system comprising; an electrostatic precipitator interposed in a duct carrying particle-laden hot gases; continuously operating means utilizing a stream of air for cleaning separated particles from the collecting surfaces of the precipitator and conveying them from the latter; an after-collector for removing the carried particles from the air stream; a fan for withdrawing the cleaned air from said after-collector and recirculating it through said precipitator, said precipitator, after-collector and fan being interconnected to form a closed circuit; an air heater; means for taking heated air from said air heater and mixing it with the stream of cleaned air before reintroduction of the latter into said precipitator; means for bleeding a determined volume of cleaned air from said closed circuit; and introducing it into the air inlet of said air heater.

4. A gas cleaning system comprising; an electrostatic precipitator interposed in a duct carrying particle-laden hot gases; continuously operating means utilizing a stream of high velocity air for cleaning separated particles from the collecting surfaces of the precipitator and conveying them from the latter; an after-collector for removing the carried particles from the air stream; a fan for withdrawing the cleaned air from said after-collector and recirculating it through said precipitator, said precipitator, after-collector and fan being interconnected to form a closed circuit; an air heater interposed in said gas duct downstream of said precipitator; means for taking heated

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air from said air heater and mixing it with the stream of cleaned air before reintroduction of the latter into said precipitator.

5. A gas cleaning system comprising; an electrostatic precipitator interposed in a duct carrying particle-laden hot gases; continuously operating means utilizing a stream of high velocity air for cleaning separated particles from the collecting surfaces of the precipitator and conveying them from the latter; an after-collector for removing the carried particles from the air stream; a fan for withdrawing the cleaned air from said after-collector and recirculating it through said precipitator, said precipitator, after-collector and fan being interconnected to form a closed circuit; an air heater interposed in said gas duct downstream of said precipitator; means for taking heated air from said air heater and mixing it with the stream of cleaned air before reintroduction of the latter into said precipitator; and means for bleeding a determined volume of cleaned air from said closed circuit at a point between said fan and precipitator.

6. A gas cleaning system comprising; an electrostatic precipitator interposed in a duct carrying particle-laden hot gases; continuously operating means utilizing a

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stream of high velocity air for cleaning separated particles from the collecting surfaces of the precipitator and conveying them from the latter; an after-collector for removing the carried particles from the air stream; a fan for withdrawing the cleaned air from said after-collector and recirculating it through said precipitator, said precipitator, after-collector and fan being interconnected to form a closed circuit; an air heater interposed in said gas duct downstream of said precipitator; means for taking heated air from said air heater and mixing it with the stream of cleaned air before reintroduction of the latter into said precipitator; means for bleeding a determined volume of cleaned air from said closed circuit at a point between said fan and precipitator; and introducing it into the air inlet of said air heater.

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