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FUEL PULVERIZING SYSTEM

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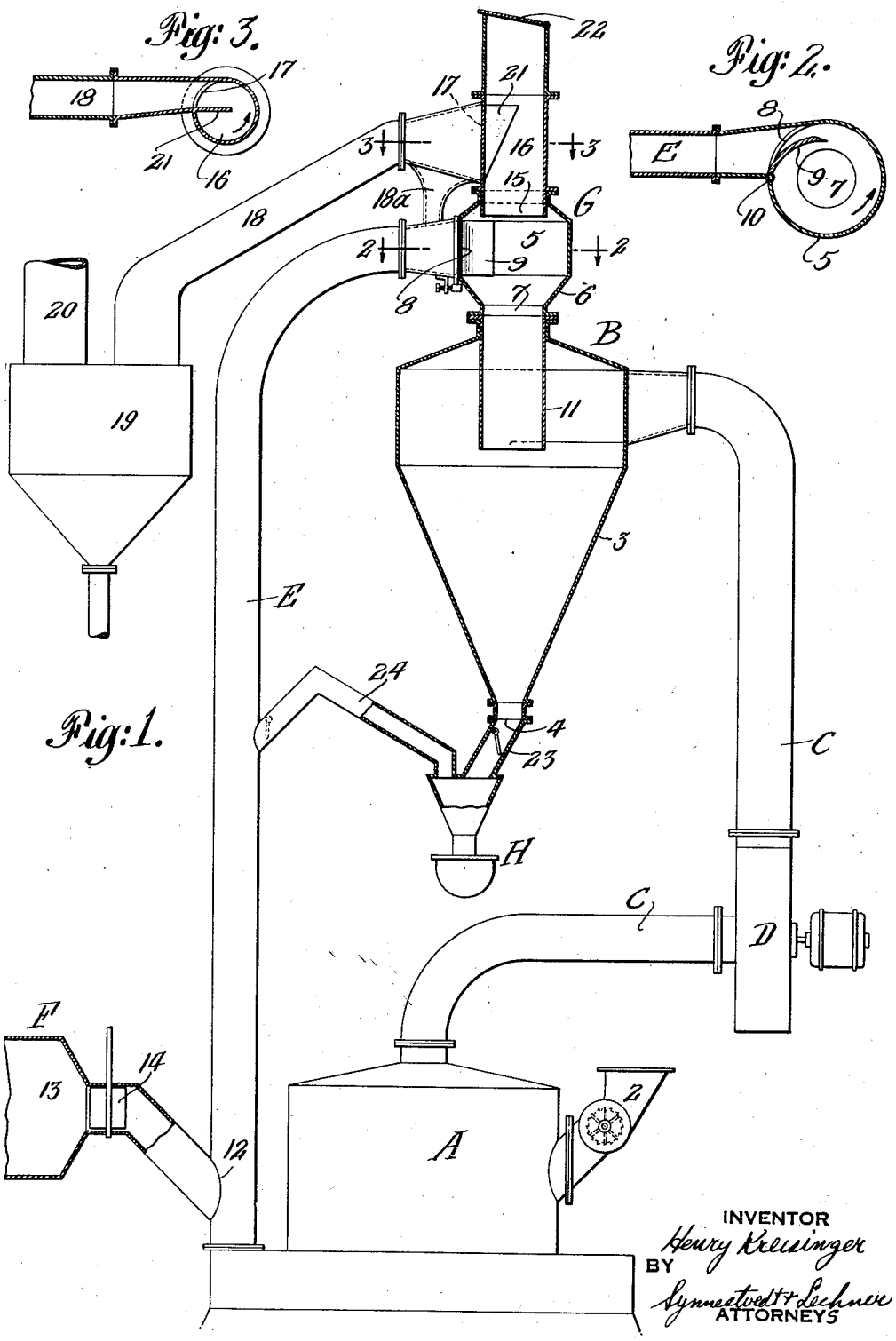

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UNITED STATES PATENT OFFICE

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FUEL PULVERIZING SYSTEM

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This invention relates to fuel pulverizing systems of the so-called closed type in which the mixture leaving the mill is delivered to a separator by means of a current of gas set up in the system and in which the unseparated mixture leaving the separator is returned to the mill.

In such systems, particularly when heat is added, for example, hot gas for the purpose of drying the fuel in the system, it is necessary to exhaust an amount of gas equal to the amount of hot gas introduced. This leads to difficulties because of the escape of pulverized material with the gas which is being withdrawn or exhausted.

The primary object of the invention is to provide an improved system in which such difficulties are overcome.

A more specific object of the invention is to associate an improved simple and effective device with the usual separator of the system which will enable gas to be withdrawn from the system without carrying off any objectionable amount of dust or pulverized material.

Another object of the invention is to provide an improved puff vent for systems of the character described.

A further object is to relieve pressure at the bottom of separator means of the system.

How the foregoing, together with such other objects and advantages as may hereinafter appear, or are incident to the invention, are realized is illustrated in preferred form in the accompanying drawing, wherein:

Fig. 1 is a more or less diagrammatic elevational view of a system embodying the invention with portions of the apparatus appearing in section to expose certain interior parts to view.

Fig. 2 is a plan section taken on the line 2—2 of Fig. 1, and

Fig. 3 is a plan section taken on the line 3—3 of Fig. 1.

The system comprises in general a pulverizer mill A, a separator device B, a delivery line C leading from the mill to the separator device, a blower D located in the line C, a return line E leading from the separator device to the mill, and means F for supplying heat to the system.

A feeder 2 is provided for introducing the material to be pulverized into the mill and when the system is to be used in connection with pulverized coal burning installations, the material would be raw coal drawn from a suitable source of supply such as a bunker or bin.

The coal pulverized in the mill is carried to the separator device B through the line C, by a current of gas set up by the blower D. The separator device includes a cyclone chamber 3 into which the mixture from the mill is tangentially delivered and in which the coal and gas are separated, the coal discharging through a check valve controlled outlet 4 preferably to a bin or conveyor and the gas passing to the return line E.

An auxiliary cyclone separator G is located between the main separator 3 and the inlet to the return line, and comprises a cylindrical chamber 5 having a conical bottom 6 terminating in an axial inlet 7, and having an outlet opening 8 in its cylindrical surface with which the return line E is connected to receive the mixture from the chamber tangentially. An adjustable damper 9 is provided for the outlet opening 8, which damper is hinged at 10 to the chamber 5 along an edge of the outlet opening. The damper is preferably curved with a radius the same as the radius of the cylindrical chamber 5.

The axial inlet 7 of the auxiliary separator G registers with the top axial outlet of the main separator 3 and a sleeve or neck 11 extends downwardly into the separator 3. The rotating gas, together with any coal particles not separated, axially enters the chamber 5 through the sleeve 11. Owing to the fact that the mixture is rotating, the dust rides up the conical surface of the bottom 6 and rotates on the cylindrical surface of the chamber 5. Referring to Fig. 2, it is to be noted that the mixture rotates in the direction of the arrow, which direction is against the free edge of the damper 9 so that the damper acts as a deflector to cause that part of the mixture having the greatest concentration of dust to be tangentially dis-

charged into the return line. Stated in another way, the damper 9 scrapes off from the rotating mixture that part which contains the most dust and returns it to the mill through the return line. The damper, in addition, may be adjusted to control the amount of flow into the return line.

The return line E discharges into the lower portion of the mill A and it is to be noted that adjacent the point where this line enters the mill, a hot air or gas inlet 12 is provided through which heat is introduced into the system. The heat may be supplied from any suitable source, for example, from an air heater 13. A suitable damper 14 is provided to control the admission of heat.

Comparatively clean rotating gas leaves the auxiliary separator G through the upper axial outlet 15 with which is associated the cylindrical chamber 16. The chamber 16 has an outlet opening 17 in the cylindrical surface thereof, through which outlet the gas with any dust still carried therewith is tangentially discharged into a line 18 leading away from the system. In this instance the line 18 leads to a gas washer 19 operating to further clean the gas prior to its discharge through a stack 20.

A vane 21 preferably triangular in shape is associated with the outlet opening 17 and is adapted to guide the rotating gas into the line 18. This vane changes the rotation of the gases into a straight line motion so that most of the energy in the rotation of the gas is converted into static pressure in the line 18.

A dust catcher 18*a* may be provided adjacent the entrance end of the line 18 for catching any dust particles gravitating out of the gas stream entering this line. The dust catcher is shown discharging into the return line.

The cylindrical chamber 16 preferably extends through the roof of the building and it is provided with a suitable relief valve as diagrammatically illustrated at 22. Thus a puff vent is provided which, owing to its location in a direct line with the axis of the main and auxiliary cyclone separators, is very advantageous because any pressure suddenly developed in the main cyclone is relieved by the straight line vent. The damper and the vane only expose their edges to the gases to be vented and, therefore, there are no obstructions in the venting of gases in case of puff.

From the foregoing it will be seen that a system is provided in which the gases to be withdrawn are comparatively clean and in which the gases having the greatest concentration of dust are returned to the mill.

The material separated in the main separator discharges through a chute 23 into the conveyor H and in order to avoid a dusty conveyor in the event that there is pressure at the bottom of the separator, the pressure is relieved through a damper controlled connection 24 leading to the return line, which line is under a slight suction.

No specific claim is made herein to the broad combination of a concentrator and separator disclosed, as claims directed thereto have been made part of the subject matter of my copending application Serial #519,798, the present application being directed to a combination of elements of specific form.

I claim:

1. In a separating system, a main separator having a tangential inlet for a mixture of material and gas and an axial outlet for the discharge of unseparated gas and dust; a skimmer having an axial inlet for receiving said discharge from the main separator, a tangential outlet, and an axial outlet; and an adjustable damper controlling the flow through the tangential outlet of the skimmer, said damper being hinged to open with its free edge against the rotating mixture in the skimmer whereby that portion of the mixture having the greatest concentration of dust will be deflected through said tangential outlet.

2. In a separating system, means for setting up current of gas through the system, and a separating device including a separator chamber tangentially receiving a mixture of material and gas and axially discharging the rotating unseparated mixture, a cylindrical chamber associated with said separating chamber to axially receive said discharge, said cylindrical chamber having a peripheral outlet and an axial outlet, and a second cylindrical chamber associated with said first cylindrical chamber to receive the discharge leaving said axial outlet, said second cylindrical chamber having a peripheral outlet and a relief valve controlled axial outlet.

3. In a separating system, means for setting up a current of gas through the system, and a separating device including a separator chamber tangentially receiving a mixture of material and gas and axially discharging the rotating unseparated mixture, a cylindrical chamber associated with said separating chamber to axially receive said discharge, said cylindrical chamber having a peripheral outlet and an axial outlet, and a second cylindrical chamber associated with said first cylindrical chamber to receive the discharge leaving said axial outlet, said second cylindrical chamber having a peripheral outlet and a relief valve controlled axial outlet, together with means in said second cylindrical chamber for changing the rotary motion of the gas into straight line motion.

4. A centrifugal separator having an axial outlet for rotating gas and dust, a cylindrical chamber for receiving the rotating gas and dust discharging through said outlet, an outlet opening in the cylindrical portion of said

chamber, a coaxial outlet opening in said chamber and a hinged deflector member in said chamber, said member being hinged to the cylindrical portion of the chamber at an edge of the first mentioned outlet opening and having a curvature corresponding to the curvature of the cylindrical portion of the casing.

5. In a separating system, a separator having an inlet for a mixture of material and gas, an outlet for unseparated gas and dust, and a bottom outlet for the discharge of separated material; means for setting up a current of gas in the system; a conveyor receiving said discharge; and means communicably connecting the lower portion of the separator to a point of suction in the system for relieving pressure from the lower portion of the separator.

In testimony whereof I have hereunto signed my name.

HENRY KREISINGER.