

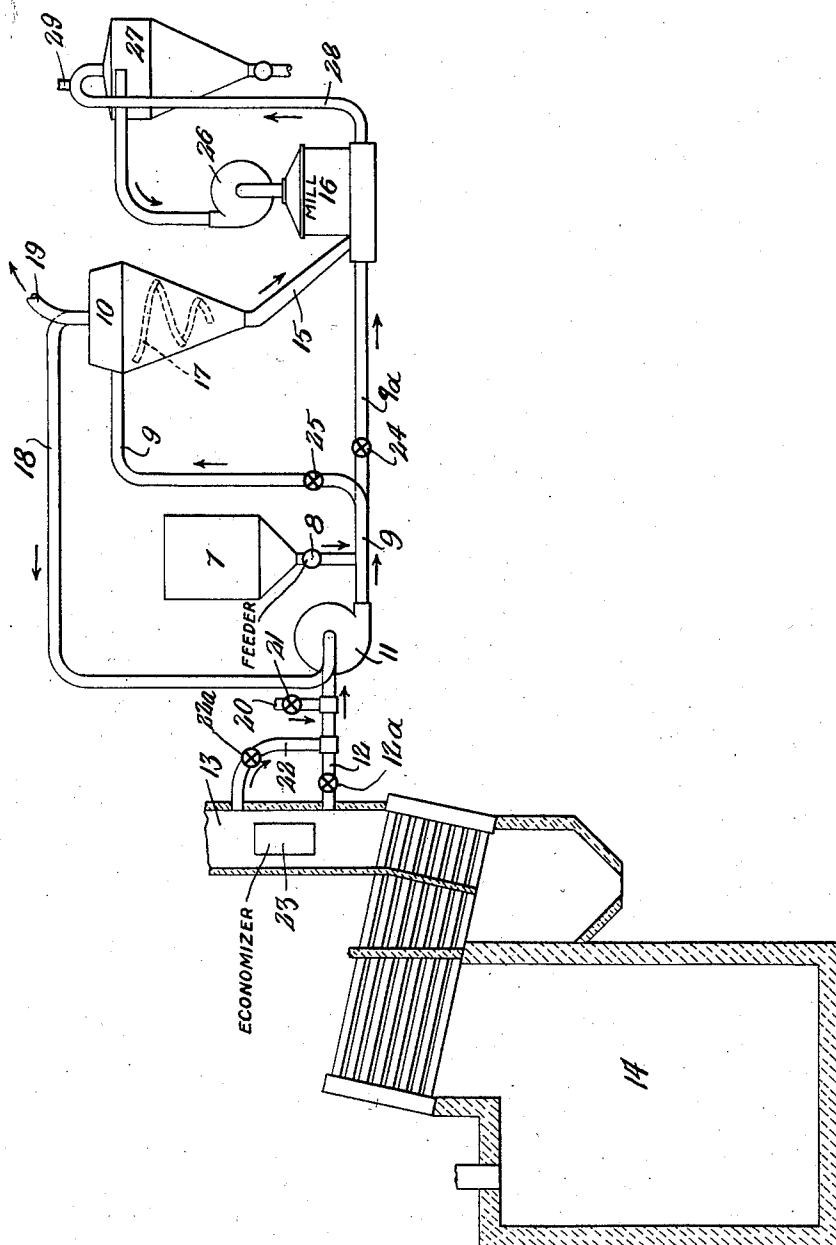
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W. RUNGE ET AL

1,775,324

MEANS FOR DRYING AND PULVERIZING COAL

Filed Jan. 15, 1926



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UNITED STATES PATENT OFFICE

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MEANS FOR DRYING AND PULVERIZING COAL

Application filed January 15, 1926. Serial No. 81,374.

This invention relates to the drying of materials, and is particularly useful for the drying of coal.

In the drying of coal, the invention is especially useful in assistance for preparing and pulverizing coal to be burned in pulverized coal burning installations, such as stationary boiler installations, low temperature distillation apparatus, and the like.

The invention will be described in connection with the preparation plant of a pulverized coal burning boiler installation.

It is the primary object of the invention to provide a simple and effective means for drying the coal, whether it be the coal to be supplied to the pulverizer, or whether it be the coal which has been pulverized.

How the foregoing, together with such objects as may hereinafter appear, or are incident to our invention, are realized is illustrated in the accompanying drawing, wherein—

The figure is a diagrammatic illustration of a pulverized coal preparing plant for a stationary boiler, the boiler furnace being shown in section.

The raw coal, which is usually preliminarily crushed in a system of this character, is stored in the bin 7, from which it is fed by a star feeder 8, or other well known type of regulable feeder, to the conveyor pipe 9, which pipe discharges to a cyclone separator 10. The coal is conveyed through the pipe 9 by means of a blast, preferably a blast of hot flue gas set up by the fan 11. A pipe 12 leads from the stack 13 of the boiler furnace 14 to the intake of the fan 11. The heat for drying the coal is supplied by the heat of this flue gas. The flue gas and coal enter the cyclone separator wherein the coal is whirled about spirally to eventually discharge through the discharge spout 15 which leads to the mill 16. We have discovered that a cyclone separator is a very effective drier by virtue of the conditions which obtain in such type of separator. If desired, the cyclone separator may be equipped with an internal spiral flange or ledge 17 to help give the coal and gas a cyclonic or vortical motion. The gases are withdrawn from the

cyclone separator 10 and returned to the intake side of the fan by means of the pipe 18, it being desirable to recirculate the gases under some conditions, in which event fresh flue gas could only be supplied through the pipe 12 intermittently, for which purpose such pipe is provided with a valve 12^a. A vent 19 is also provided for the cyclone separator to vent any excess gas in this portion of the system, this vent being led to the stack, or any other suitable point, depending upon the presence or absence of dust particles therein.

It may be desirable to temper the flue gas with air in order to regulate the temperature thereof, to which end we provide a pipe 20 opening into the pipe 12 for supplying air to dilute the flue gas, the amount of air being controlled by the valve 21. Inasmuch as the coal may be fairly dry at times, in fact, sufficiently dry as to not need any drying, the valve 12 may be kept closed, and the valve 21 open, in which case the carrying blast will be composed of air entirely.

To afford additional control over temperature, we provide a pipe 22 leading from the stack at a point beyond the economizer 23 to the pipe 12, the pipe 22 being controlled by a valve 22^a. The pipe 12 leads from the stack in advance of the economizer (which may be an air preheater, for example); and, therefore, supplies much hotter gas than would be supplied through the pipe 22. Therefore, by proper manipulation of the valves 12^a and 22^a and 21, any desired degree of temperature may be obtained.

In cases where the coal need not be dried at all, or may only need a small amount of drying, it will be unnecessary to pass the coal, or all of the coal, through the cyclone separator 10, and we, therefore, provide a by-pass 9^a leading directly to the mill 16, such by-pass being controlled by a valve 24. There is a valve 25 provided for the pipe 9. Hence, by proper manipulation of the valves 24 and 25, all of the coal may be passed directly to the mill, or all of the coal passed to the mill through the cyclone separator, or part of the coal may be supplied directly to the mill,

and part indirectly through the cyclone separator.

The coal which has been pulverized in the mill 16 is lifted by an air blast created by the fan 26 into the cyclone separator 27, where the carrying air is unloaded of the coal. The air is returned to the mill through the return pipe 28, and the separated coal may be discharged from the cyclone separator 27 directly to the furnace, or to an intermediate bin, or the like. When the coal is not very wet, the drying may be done in the mill and in the cyclone separator 27, in which event the coal would be carried by a hot blast through the pipe 9^a to the mill, this hot blast constituting a portion of the carrying medium for carrying the pulverized coal from the mill 16 to the cyclone separator. In such practice, a portion of the gas will be taken from the return pipe 28 by means of the pipe 29, the hot gas used to introduce the coal to the mill replacing the amount drawn off, whereby the moisture content in the system is kept down, and a drying action occurs in the mill, and in the cyclone separator 27.

Obviously, coal which has been pulverized, and which may be moist, can be dried by carrying it through a cyclone separator in a hot blast, in accordance with our invention.

What we claim is:—

1. In a pulverized coal burning system, a furnace having an off-take for the waste gases, a source of supply of raw coal, a mill, a cyclone separator intermediate the source of supply and the mill, a conduit leading from the separator to the mill, and means for creating a blast of flue gas for carrying the raw coal to the separator.

2. In a pulverized coal burning system, a furnace having an off-take for the waste gases, a source of supply of raw coal, a mill, a cyclone separator intermediate the source of supply and the mill, a conduit leading from the separator to the mill, and means for creating a blast of flue gas for carrying the raw coal to the separator, together with means for diluting the flue gas with air.

3. In combination, a pulverized fuel burning furnace having an off-take for the waste gases, an economizer in said off-take, and means for utilizing flue gas comprising a fuel drying and transporting system including connections for taking off flue gas in advance and behind the economizer, said connections being controlled by valve means whereby the temperature of the flue gas used in the system may be regulated.

4. In combination, a mill, a source of supply of raw coal, a cyclone separator, a connection from the source of supply to the separator, a by-pass from the source of supply to the mill, and means whereby said separator discharges to the mill.

5. In combination, a pulverized coal burning furnace having an off-take for the waste

gases of combustion, a mill, a source of supply of raw coal for the mill, a separator intermediate the mill and said source of supply, a conduit leading from the separator to the mill, means whereby flue gas may be utilized in the transport of the coal to the separator, a second separator, means whereby the coal pulverized in the mill is carried to said second separator in suspension, and a return pipe from said second separator to the mill.

In witness whereof we have hereunto signed our names.

WALTER RUNGE.
EDWIN A. PACKARD.

CERTIFICATE OF CORRECTION.**Patent No. 1,775,324.****Granted September 9, 1930, to****WALTER RUNGE ET AL.**

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, lines 67, 72, 74 and 75, claim 5, before the word "separator" insert the word cyclone; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 21st day of October, A. D. 1930.

(Seal)

**M. J. Moore,
Acting Commissioner of Patents.**

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