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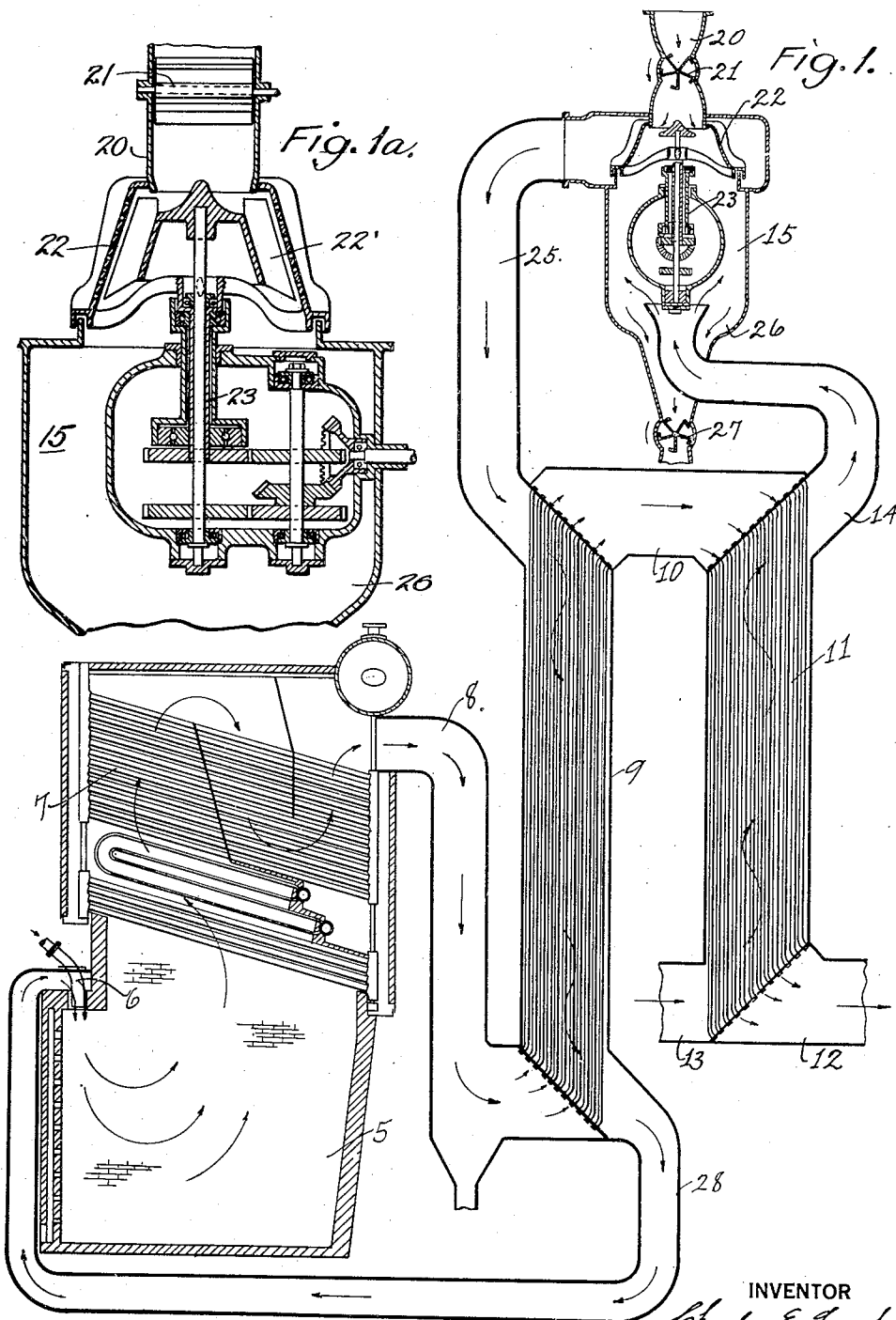
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PROCESS AND APPARATUS FOR DRYING COAL

Filed Nov. 3, 1927

2 Sheets-Sheet 1



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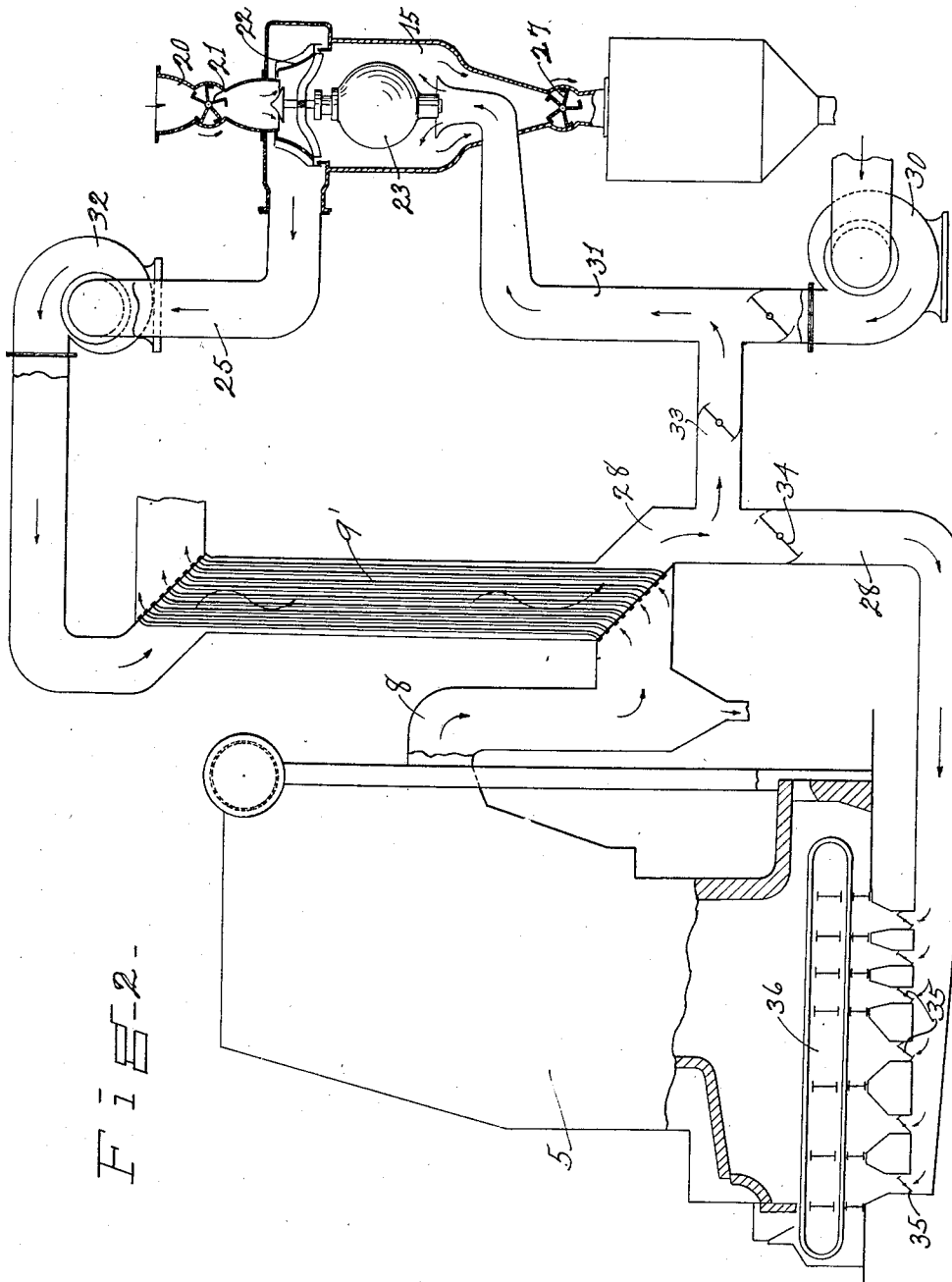
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PROCESS AND APPARATUS FOR DRYING COAL

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This invention relates to a process and apparatus for drying coal by passing air into contact therewith and subsequently using the moist air that is laden with fine coal dust for combustion purposes. The invention will be understood from the description in connection with the accompanying drawings in which Fig. 1 is a vertical section of an illustrative embodiment of the invention; Fig. 1a is a vertical section on an enlarged scale showing some of the details; and Fig. 2 is a similar section showing a modification. In the drawings, reference character 5 indicates a furnace that is provided with fuel burners 6. A water tube boiler 7 of a well known type is located above the furnace and an outlet 8 is provided for the waste products of combustion from the furnace.

The outlet 8 leads to a tubular air heater 9, the gas spaces of which are connected by a flue 10 to another air heater 11, from which the spent gases pass through the outlet 12 to a stack.

Cold air enters the air heater 11 through the inlet 13 and passes along the outside of the tubes and becomes heated by the hot gases passing through the tubes. The heated air passes through the outlet 14 that leads to a coal dryer 15. The coal dryer 15 is of the type in which wet coal is dried by the air coming into direct contact with the particles of coal and absorbing moisture as well as picking up fine dust particles from the coal. Coal dryers suitable for the purpose are well known in the prior art. In a dryer of this type coal is introduced through the hopper 20 and valve 21 to a perforated centrifugal basket 22 that is driven by the driving mechanism 23 and may be provided with scraper blades 22' on the inside driven at a differential speed with respect to the perforated basket, so that the coal is carried down gradually as it lies in thin layers against the inside of the basket 22, due to the centrifugal force. The warmed air after passing through the layer of coal and picking up moisture and dust, passes through the outlet 25 to the air heater 9. The dry coal passes into a lower portion 26 of the dryer and is removed therefrom through the outlet 27 that is provided with a valve. The humidified air laden with dust passing through the connection 25 along the outside of the tubes of the heater 9 has its temperature increased and the hot air passes through the conduit 28 to the burners 6 and is used for combustion purposes in the furnace.

In the modification shown in Fig. 2, a single air heater 9' is illustrated. In this modification cold air is forced by the blower 30 through the valved conduit 31 to the coal dryer 15 and a blower 32 passes the air through the outlet 25 to the heater 9'. A portion of the hot air from the hot humidified and dust laden air passing out of the heater 9' through the outlet 28, passes through a valved by-pass 33 into the conduit 31 and is recirculated through the dryer. The amount of air that is recirculated through the dryer can be controlled by the blowers 30 and 32 and valve in the by-pass 33. A valve 34 is provided in the conduit 28 and this conduit leads through valved branches 35 to the boxes beneath the chain grate stoker 36 with which the furnace 5 in this modification is provided.

This invention is especially useful in connection with boilers that are provided with chain grate stokers. In such boilers, troubles often arise because of excessive temperatures on the grates, for example, causing the ash to fuse or making the metal parts of the stoker too hot. By the present invention water vapor is provided in the air that is introduced through the grate for combustion purposes, thus minimizing or overcoming the difficulties mentioned above. The endothermic reaction that causes the water to be decomposed to form with carbon H_2 and CO in the fuel bed lowers the temperature of the zone near the grate and the exothermic reaction by which the gases, hydrogen and carbon monoxide are subsequently burned at a higher place in the furnace prevents waste of heat. The lowering of the temperature at the bottom of the fuel bed without decreasing the efficiency is very desirable, as it will decrease or obviate the difficulties due to overheating of the stoker and lower fuel bed. The heat for drying the coal is obtained from

the waste gases from the furnace, and the heating and humidifying of the combustion air is obtained from the same source. The fine particles of combustible material removed in drying the coal are utilized in the furnace and the main body of the coal is dried. By thus burning the fine coal dust, the objectionable discharge of such dust into the air common to some existing coal dryers is avoided, and all fuel value in the dust is recovered. It is understood that the heating of the air is desirable but not necessary for the drying of coal and the disposal of dust set free by drying.

I claim:

1. The process which comprises drying coal by passing air into contact with it and thereby removing dust from the coal, heating the dust laden air from the coal, and utilizing it for combustion purposes.

2. The process which comprises drying coal by passing air through thin moving layers of it and thereby removing dust from the coal, heating the dust laden air from the coal and utilizing it for combustion purposes.

3. The process which comprises heating air, passing it through layers of coal and thereby removing dust from the coal, heating the dust laden air from the coal and introducing it into a furnace.

4. The process which comprises heating air by waste products of combustion from a furnace, passing it through layers of coal and thereby removing dust from the coal, heating the dust laden air from the coal and introducing it into a furnace.

5. The process which comprises heating air in two stages by means of waste products of combustion from a furnace and passing it into contact with wet coal between the stages.

6. The process which comprises heating air in two stages and passing it into contact with wet coal between the stages and then introducing it into a furnace.

7. The process which comprises heating air in two stages, passing it into contact with wet coal between the stages and thereby removing dust from the coal, and utilizing the dust and moisture laden air for combustion purposes.

8. In combination, an air heater, a coal drier, means to convey heated air from said heater to said drier, a furnace, and means to convey the air from said drier to said furnace.

9. In combination, an air heater, a coal drier, means to convey heated air from said heater to said drier, a furnace, and means to heat the air after it leaves said drier and convey it to said furnace.

10. In combination, an air heater, a coal drier, means to convey heated air from said heater to said drier, a furnace, means to convey the air from said drier to said furnace, and means whereby the waste products of

combustion from said furnace are utilized to heat the air.

11. In combination, two air heaters, a coal drier, means to cause air to pass through one of said heaters thence through said drier and thence through the other air heater, and means to heat said heaters by a heating medium passing therethrough in the reverse order of the passage of air.

12. In combination, two air heaters, a coal drier, means to cause air to pass through one of said heaters, thence through said drier into contact with wet coal therein and thence through the other air heater, and means to heat said heaters by a heating medium passing therethrough in the reverse order of the passage of the air.

13. The method of burning coal which comprises drying the coal by air, removing dust from the coal by the air and supplying to the furnace, dry coal, humidified air and dust that has been removed from the coal by drying.

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