

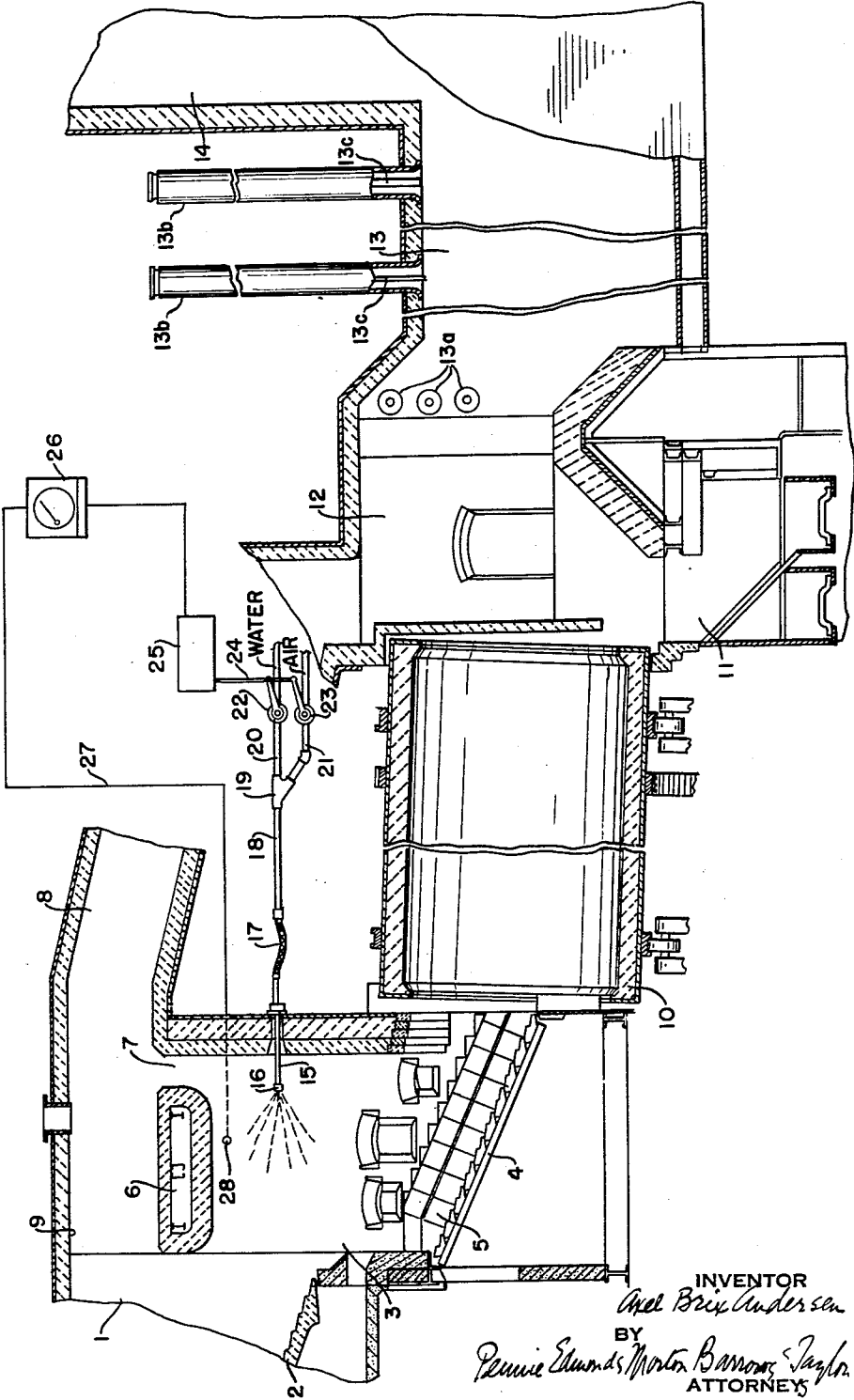
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INCINERATOR WITH WATER COOLED IGNITION CHAMBER

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INCINERATOR WITH WATER COOLED IGNITION CHAMBER

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1 Claim. (Cl. 110—15)

This invention relates to furnaces or incinerators for the combustion of municipal waste materials in the form of refuse and garbage. More particularly, the invention is concerned with improvements for use in incinerators of the type shown in Patent 2,015,842, issued October 1, 1935, for overcoming difficulties arising from the formation of slag.

In the incinerator of the patent, the material to be burned is introduced into a drying chamber and passes therefrom into an ignition chamber, in which the burning operation is started. The material leaving the ignition chamber then travels through a rotary kiln, in which the burning of the solid constituents is completed. The gases from the kiln pass into a final combustion chamber, while part of the gases from the ignition chamber enter the kiln and the remainder leave the ignition chamber through a throat opening in the ceiling of the chamber and travel through a by-pass duct to the combustion chamber, where combustion of all the gases is completed.

In the operation of incinerators of the construction described, solid particles are entrained in the gases and, if the temperature in the ignition chamber is sufficiently high, the particles form slag on the surfaces of the refractories defining the throat and restrict the size of the opening. As a result, the flow of gases to the by-pass duct is impeded and the temperature in the ignition chamber increases, so that the slag forms in the throat at a progressively higher rate and, in some cases, slagging on the castings forming the side walls of the chamber may occur. Ultimately, the slag closes the throat and, when this occurs, the incinerator must be shut down and the slag removed. The removal of the slag is effected by means of air jack hammers and, since it must be done carefully to avoid damage to the castings and refractories, the operation is slow and laborious. More recently, the difficulties arising from slag formation have been aggravated by the presence in the materials to be burned of increasing amounts of highly combustible constituents, which produce higher temperatures in the ignition chamber.

The present invention is directed to improvements for use in incinerators of the type described for the purpose of overcoming difficulties arising from slag formation. The improvements achieve the desired purpose by controlling the temperature of the gases within the ignition chamber, so that the solid particles entrained in the gases leaving through the throat opening do not reach a condition, in which they will adhere as slag to the surfaces defining the throat. As a result, the particles pass freely through the opening and are carried with the gases through the by-pass duct into the final combustion chamber.

For a better understanding of the invention, reference may be made to the accompanying drawing, in which the single figure is a vertical longitudinal sectional view with parts omitted and other shown diagrammatically, of an incinerator equipped with the improvements of the invention.

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The incinerator illustrated includes a drying chamber 1 containing a support 2, usually a grate, upon which the waste materials are deposited. The materials travel down the support as the drying proceeds and enter an ignition chamber 3 containing a grate 4, upon which the materials land and which is preferably of a type having moving parts causing the material deposited thereon to advance down the grate. In the ignition chamber, the combustion of the materials on the grate 4 is started and is carried on by means of air supplied through the grate. The sides of the chamber adjacent the grate are lined with castings 5 and, near its upper end, the chamber has a ceiling 6 which, with the walls of the chamber, defines a throat opening 7 leading to a by-pass duct 8. The drying chamber, the ignition chamber, and the duct are lined with refractory material indicated at 9 and the ceiling 6 is likewise faced with refractory material.

The material partially consumed in the ignition chamber is discharged from the grate 4 into the upper end of a rotary kiln 10, in which the combustion is completed. The residue issuing from the lower end of the kiln enters a dumping chamber 11, from which the material is carried away by conveying means, while the gases leaving the kiln enter a final combustion chamber 12, to the top of which the by-pass duct 8 leads. In the chamber 12, the combustible constituents of the gases are fully burned and the gases then travel through a passage 13 to the stack 14. The wall of the passage may be provided with ports 13a for the insertion of smoke indicators, thermocouples, etc., and with chambers 13b opening into the passage through the top, into which screen baffles indicated at 13c and used for intercepting particles of material entrained in the gases, may be withdrawn when such baffles are not in use.

The draft induced by the stack causes gases from the ignition chamber to flow partly through the kiln and partly through the by-pass duct and the gases entrain solid particles. If the temperature of the particles is sufficiently high, they have a tendency to adhere to the refractory surfaces defining the throat opening and form slag which may also form on the castings 5 under proper conditions.

In order to maintain a temperature within the ignition chamber below that, at which slag forms, a pipe 15 is mounted removably in an opening through the wall of the chamber and carries a nozzle 16 at its inner end within the chamber, the nozzle lying below the ceiling and in the vicinity of the throat opening. The pipe 15 is connected by a flexible section 17 to a pipe 18 connected to a mixing device 19, to which water and air under pressure are supplied through pipes 20, 21, respectively. In the mixing device, a mixture of air and droplets of water is produced and the mixture is discharged through the nozzle 16 into the chamber 3. Valves 22, 23 are provided in the pipes 20, 21, respectively, for control of the amount of water and air traveling there-through and the valve handles are connected by an operating rod 24 to a conventional valve activator 25. The activator is in circuit with a recording or indicating controller 26 which actuates the activator 25, and the controller 26 is connected by a line 27 to a thermocouple 28 responsive to the temperature of the gases in the chamber 3.

In the operation of the incinerator described, a spray of droplets of water is introduced into the gases in the ignition chamber 3 and the amount of water in the spray is regulated so that the droplets evaporate while in suspension and do not land on the walls of the chamber. The evaporation of the droplets abstracts heat from the gases and reduces their temperature and the amount of water introduced into the chamber in the form of droplets is so regulated so as to maintain a gas temperature

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below that at which slag forms on the throat surfaces. The regulation of the amount of water is effected by the controller 26, which actuates the activator 25 to cause the latter to vary the openings of the valves 22, 23 in response to variations in the temperature in chamber 3 5 detected by the thermocouple 28. With the gases passing through the throat opening maintained at a temperature such as to avoid slag formation because of the evaporation of the droplets in the chamber, the incinerator can be operated indefinitely without shut-downs, such as have 10 heretofore been caused by slag.

I claim:

In an incinerator including an ignition chamber having a support for burning material and a ceiling with a throat opening for escape of gases, a rotary kiln adjacent the support receiving material therefrom, a final combustion 15 chamber at the outlet end of the kiln receiving material leaving the kiln, a by-pass duct for conducting gases from the throat opening around the kiln to the final combustion chamber, and means for causing a stream of gases 20 to flow from the ignition chamber through the by-pass duct and another stream of gases to flow from the ignition chamber through the rotary kiln, the streams enter-

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ing and becoming united in and flowing through the final combustion chamber, the combination of means for cooling particles of solid material in the gases in the ignition chamber about to enter the by-pass to a temperature below that of adherent slag, said means including a pipe extending through the wall of the ignition chamber and carrying a nozzle on its end within the chamber, means for supplying a water-air mixture to the pipe for discharge as water droplets through the nozzle, the nozzle directing a spray of the droplets across the stream of gases about to enter the by-pass, means for regulating the supply means, and means responsive to the temperature within the ignition chamber for controlling the action of the regulating means.

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