Dec. 24, 1929. J. M. HILL 1,740,594

SMOKE CONDENSER

Filed Dec. 2, 1927 2 Sheets-Sheet 1

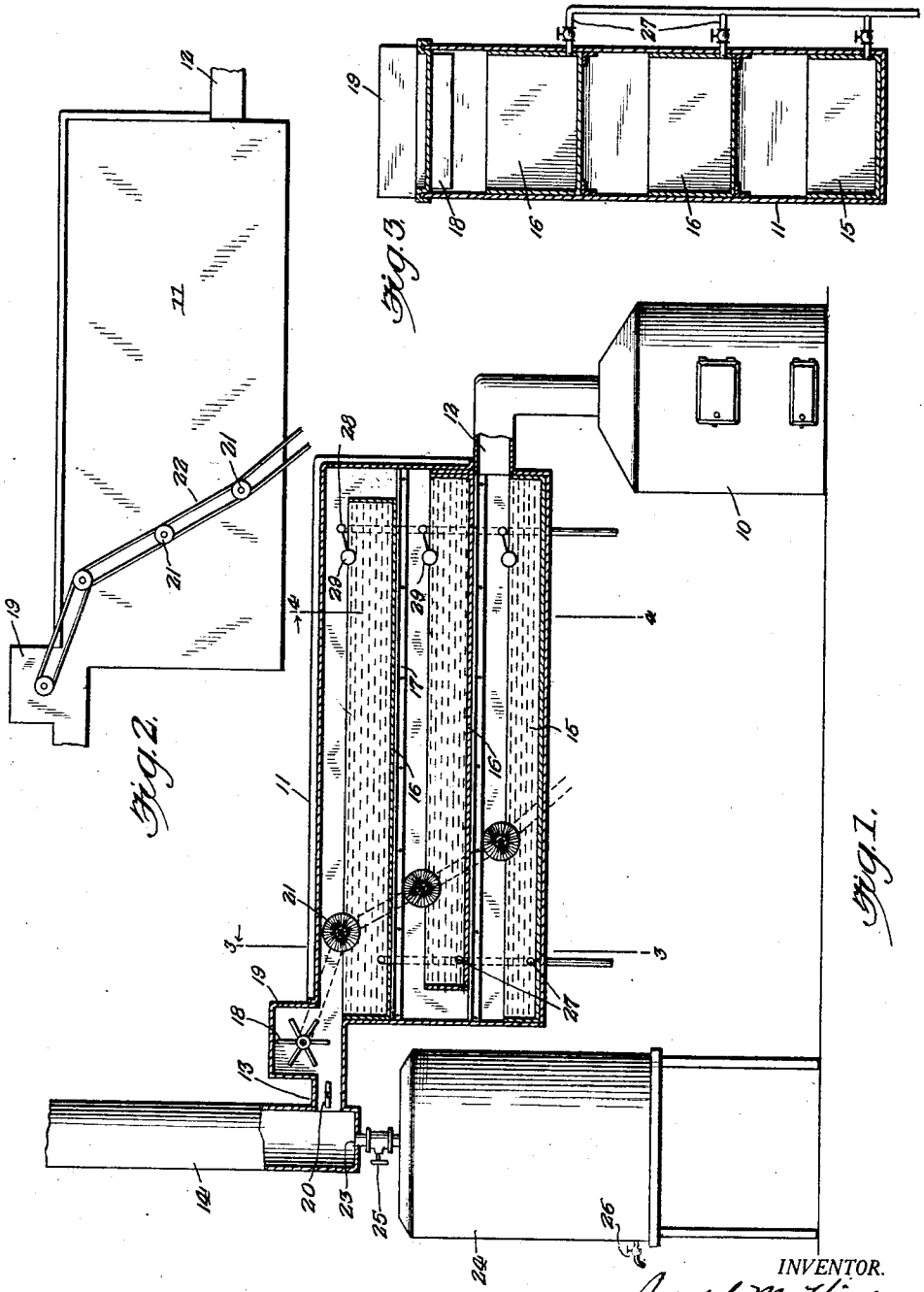


Fig. 1.

Fig. 2.

Fig. 3.

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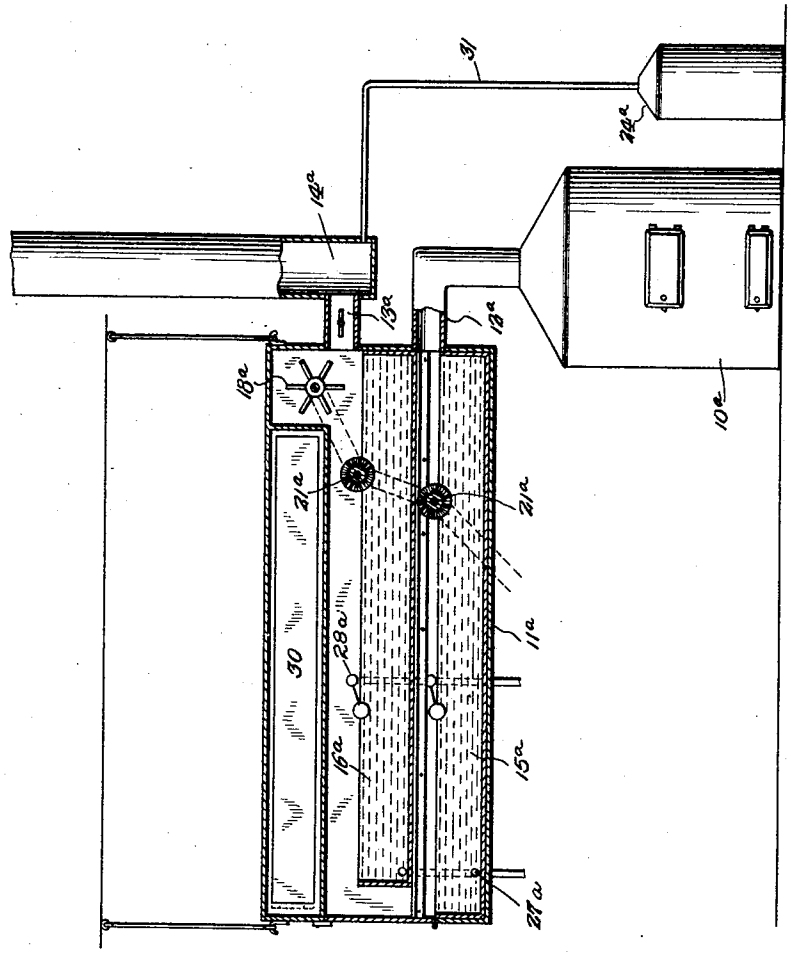


Fig. 5.

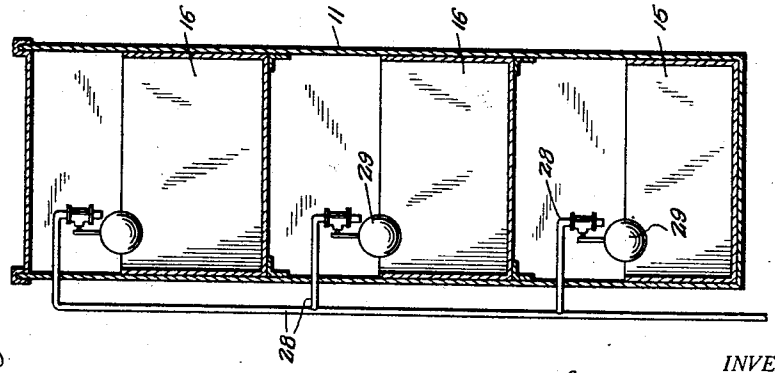


Fig. 4.

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UNITED STATES PATENT OFFICE

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SMOKE CONDENSER

Application filed December 2, 1927. Serial No. 237 266.

This invention relates to improvements in smoke condensers or devices for removing smoke from furnace gases and the like.

Primarily, the invention seeks to increase the efficiency of devices of this character. Specifically, the invention consists in providing a condenser casing having therein a plurality of receptacles for water, the receptacles being so arranged with respect to each other that the furnace gases must pass over the water in each receptacle and, at the same time, impinge against the bottoms of said receptacles. In this way, the heated gases raise the temperature of the water to a rather violent boiling condition, the gas passages being filled with vapors generated thereby, so that, by the time the gases reach the flue, the soot or carbon particles therein have combined with the vapors, and when the vapors condense while passing up the flue, the soot or carbon particles carried thereby settle in the bottom of the flue in the form of creosote or coal tar, while the clarified gases rise and escape from the flue. When the furnace is initially placed in operation, means are provided for creating a draft through the gas passage between the several receptacles and for agitating the liquid in said receptacles, so as to project a spray of the liquid into said gas passages for the purpose of facilitating the combination of the soot or carbon particles with the liquid constituting such spray. However, after the liquid in the several receptacles has been raised to a temperature sufficient to vaporize, the agitating devices are no longer necessary. This is also true of the means for creating the draft, and, as a consequence, these portions of the devices may then be rendered inoperative.

A further object of the invention is to provide means for utilizing the heat units of the escaping gases. For this purpose an oven or like chamber may be provided in the casing of the condenser, whereby food products may be cooked by means of heat units which will ordinarily by carried off by the escaping gases.

With these and other objects in view, the invention consists in certain novel details of construction and combinations and arrangements of parts, all as will hereinafter be more fully described and the novel features thereof particularly pointed out in the appended claims.

In the accompanying drawings,—

Figure 1 is a side elevational view, partly in section illustrating the preferred embodiment of the invention;

Fig. 2 is a side elevation of the opposite side of the condenser;

Fig. 3 is a transverse sectional view on the line 3—3 of Fig. 1;

Fig. 4 is a transverse sectional view on the line 4—4 of Fig. 1; and

Fig. 5 is an elevational view, partly in section, illustrating a modified form of condenser in that the latter has embodied therein a baking oven or like compartment.

In the embodiment of the invention illustrated in Fig. 1, wherein the furnace 10 is diagrammatically shown, the condenser consists of a casing 11 in the lower portion of which there is an inlet 12 adapted to communicate with the furnace and in the upper portion of which there is an outlet 13 adapted to communicate with the smoke stack or flue 14. Within the casing 11 there is a plurality of water receptacles, preferably in the form of trays removably secured in the casing. The lowermost tray 15 rests in the bottom of the casing, while the upper trays 16 are supported by ledges in the form of angle irons 17 bolted or otherwise attached to the sides of the casing. The several trays are spaced vertically from one another and they are each of such depth as to provide a passage for the furnace gases between the water contained in each of them and the bottom wall of the next uppermost tray or receptacle. For instance, the level of the water in tray 15 is just below inlet 12 so that gases flowing from the furnace pass over the water and impinge against the bottom of the next upper tray 16 and as this latter tray, at one end, is spaced from the end of casing 11, the gases, after flowing over the water in tray 15, rise and flow in the reverse direction through the space between the next two upper trays until they reach the end of the casing, whereupon they again rise and flow through the space between the water in

the uppermost tray and the top of the casing to and through outlet 13.

When the condenser is first placed in operation it is necessary that means be provided for agitating the water and projecting a spray into the space through which the gases flow and it is also necessary that means be provided for initially creating a draft through such spaces in a direction toward the flue 14. To accomplish this, a suction fan 18 is housed in a dome-like portion 19 of casing 11 a short distance in advance of outlet 13 and the damper 20 in said outlet. Also, in each liquid receptacle there is an agitator consisting of a shaft 21 journaled in the sides of the casing 11, said shafts carrying bristles or other radially projecting members whereby, when the shafts are rotated, the water in the several receptacles will be agitated and a spray projected from each receptacle into the space through which the gases flow. Preferably, the several shafts 21 are connected together and in turn connected to the shaft of fan 18 whereby they may all be driven in unison from a common source of power. Such connections are illustrated diagrammatically in the present instance, as at 22, in the form of ordinary sprocket chains.

In operation, a draft is initially created through the condenser by means of the fan 18 and gases drawn from the furnace 10 pass through the spaces between the several receptacles, particles of water being picked up by the soot in the gases as the latter pass through the sprays created by the agitators 21. At the same time, the gases continuously passing in contact with the bottoms of the uppermost receptacles 16, as well as in contact with the surface of the water in the several trays, gradually raise the temperature of the water to a point where boiling or vaporization will take place. Under these circumstances, the vapors present in the spaces through which the gases flow, saturate the particles of soot in the gases so that the sprays created by agitators 21 are no longer necessary and, at the same time, an efficient circulation of the gases through the flue having been set up, the fan 18 may also be dispensed with. As the gases pass upwardly through the flue the vapors condense and the saturated particles of soot are precipitated to the bottom of the flue, accumulating at the lowermost portion thereof in substantially a liquid state. Excessive accumulation of the soot at this point is prevented by having an outlet 23 in the bottom of the flue through which the liquid particles may pass into the creosote or coal tar settler 24, the passage of the liquid particles through said outlet 23 being controlled by a valve 25 of any desired construction. The settler 24 may be provided with a main valve 26. The particles of soot also accumulate to some extent in the several receptacles 15, 16, and for this reason the latter are also provided with drain valves 27. Due to the evaporation of the water in the several receptacles each of the latter has a supply pipe 28 communicating therewith, the passage of water through the pipes to the receptacles being controlled by float valves indicated diagrammatically at 29.

In the form of apparatus shown in Fig. 5, the furnace 10^a communicates with the condenser casing 11^a through the inlet opening 12^a, said gases passing in contact with the water in the bottom tray 15^a and in contact with the bottom wall of tray 16^a. At one end of tray 16^a the gases rise and pass between the water in that tray and the bottom wall of an oven or other chamber 30 formed in the uppermost portion of casing 11^a, after which they pass through the outlet opening 13^a to the flue 14^a. In this construction the agitators 21^a and fan 18^a are also provided and each receptacle may be drained through drain valves 27^a. Water is supplied through the supply pipes 28^a which are float-controlled. The soot, in more or less liquid form, may be drained from the bottom of flue 14^a through pipe 31 to the settler 24^a which may be provided with a drain as illustrated in Fig. 1.

The casing 11^a is suspended by any suitable suspension members from the ceiling of the room in which it is located and by providing the oven 30 in the casing a considerable portion of the heat units contained in the gases, which would otherwise be lost, may be utilized for cooking articles of food placed in said oven. In other respects, the operation of the condenser is like that of the device illustrated in Fig. 1 and further description of the same is deemed to be unnecessary.

Another advantage of the constructions above described is the improbability of sparks passing up the flue. By passing the gases through the elongated, tortuous passage filled with water vapor, all sparks are extinguished. Again, the warm water of condensation accumulates on the walls of the flue and should any sparks reach the same they would be extinguished.

What I claim is:

1. In a device for removing smoke from furnace gases, a casing having an inlet near its bottom adapted to communicate with a furnace and an outlet near its top adapted to communicate with a furnace flue, a series of vertically spaced water receptacles in said casing, the spaces between juxtaposed receptacles forming a passage through which the gases flow from said inlet to said outlet, means at the bottom of said flue for collecting impurities extracted from the gases and means near said outlet for creating a draft through said passage toward said flue.

2. In a device for removing smoke from furnace gases, a casing having an inlet near its bottom adapted to communicate with a

furnace and an outlet near its top adapted to communicate with a furnace flue, a series of vertically spaced water receptacles in said casing, the spaces between juxtaposed receptacles forming a passage through which the gases flow from said inlet to said outlet, means for supplying water to said receptacles, means for initially creating a draft through said passage toward said flue, and means for agitating the water in said receptacles to project a spray of water from said receptacles into the gas passage until the water in said receptacle is heated to vaporizing temperature, and means at the bottom of said flue for collecting impurities extracted from said gases.

3. In a device for removing smoke from furnace gases, a casing having an inlet near its bottom adapted to communicate with a furnace and an outlet near its top adapted to communicate with a furnace flue, a series of vertically spaced water receptacles in said casing, the spaces between juxtaposed receptacles forming a passage through which the gases flow from said inlet to said outlet, means for supplying water to said receptacles, a fan for initially creating a draft through said passage toward said flue, a series of agitators journaled in said casing for projecting a spray of water from each receptacle into the gas passage until said water is heated to vaporizing temperature by said gases, driving connections between said fan and said agitators and means at the bottom of said flue for collecting impurities extracted from said gases.

JOSEPH M. HILL.