H. J. DELANEY.

SMOKE PURIFIER.

APPLICATION FILED SEPT. 8, 1911.

1,067,321. Patented July 15, 1913.

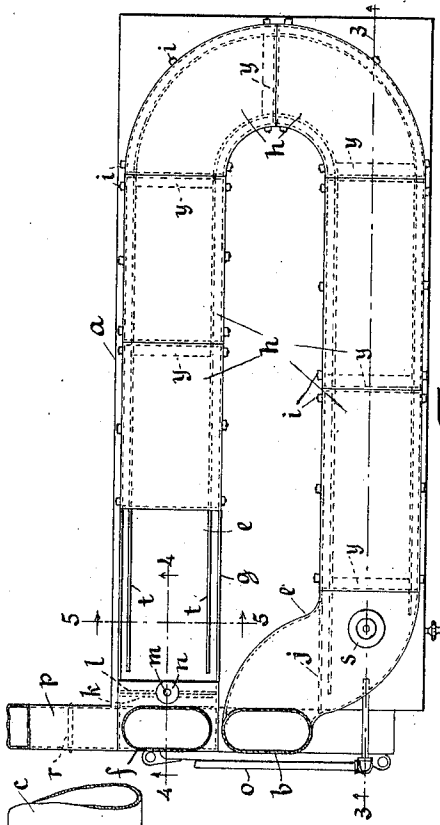


Fig. 2

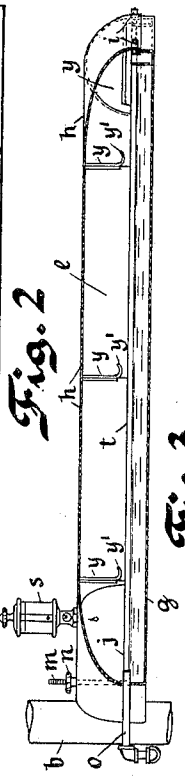


Fig. 3

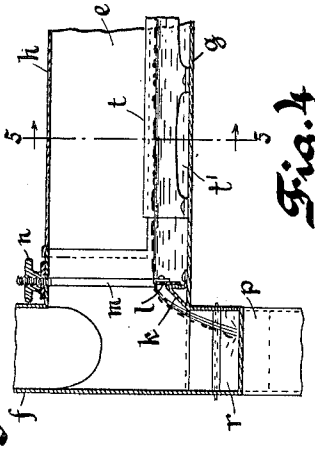


Fig. 4

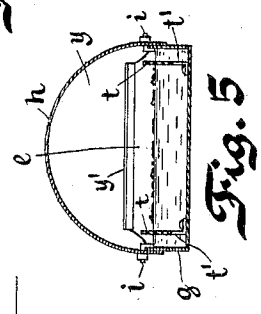


Fig. 5

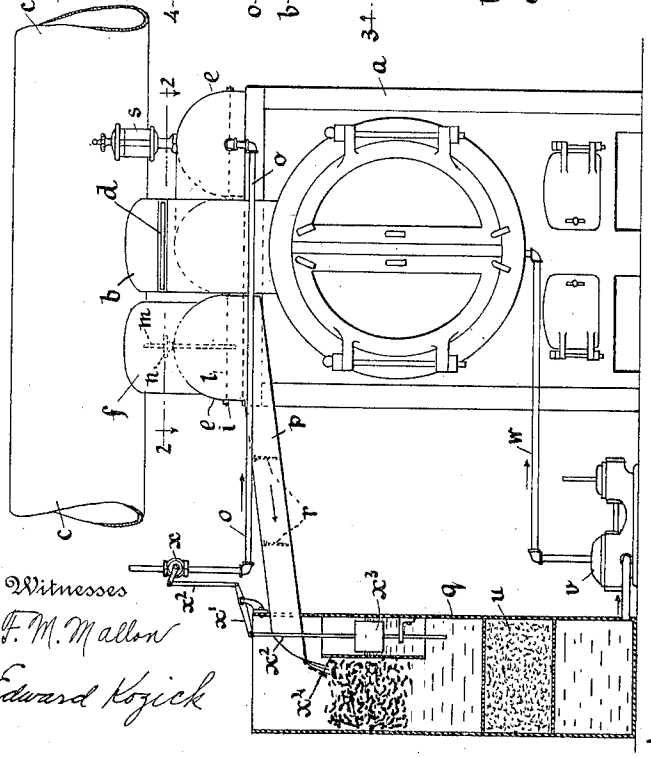


Fig. 1

Witnesses

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SMOKE-PURIFIER.

1,067,321. Specification of Letters Patent. Patented July 15, 1913.

Application filed September 8, 1911. Serial No. 648,271.

To all whom it may concern:

Be it known that I, HENRY J. DELANEY, of Milwaukee, Wisconsin, have invented a Smoke-Purifier, of which the following is a specification.

This invention relates to devices applicable to furnaces, more especially boiler-furnaces, for the prevention of smoke, and incidentally for other useful purposes, as will hereinafter appear.

The object of my invention is to provide an apparatus through which the gases of combustion may be passed for the purpose of extracting therefrom the greater part of the solid particles of carbon which form the deleterious portion of the smoke, and subsequently to collect the same as a by-product. To this end I provide a horizontally extending tunnel or flue, through which the gases of combustion are passed as they come from the furnace, and before passing to the stack; on the base or floor of which tunnel is a stratum of water, upon which the gases of combustion are caused to deposit the solid particles of carbon which they carry, or a portion thereof. The floor of said tunnel or flue acts as a canal for water, which is kept moving along the same in a stream, a fresh supply of water being fed in at one end thereof and the water being caused to flow over a weir at the opposite end carrying with it the carbon which is floating on its surface. Hence, the water carrying the carbon is carried to a tank or reservoir, where the one is separated from the other, the carbon being collected and subsequently dried, and marketed for any of the purposes for which lamp-black is commonly used, and the water, which is thereby heated to a certain extent, returned to the boiler. In this manner I utilize not only the waste carbon, but also the heat of the gases of combustion for industrial purposes.

A secondary feature of my invention consists in providing a film of oil on the surface of the water, thereby assisting it to take up the carbon; and as an additional feature I provide baffle-plates or like devices whereby the current of gases is brought into close proximity to the water, and caused to produce eddies, which brings it into more thorough contact with the water or oil-film, and also causes fresh surfaces of the water to be exposed to the carbon.

Other accessory features and constructions forming parts of my invention will be hereinafter more particularly described and set forth in my claims.

For the better understanding of my invention, I have illustrated the same in the accompanying drawings, wherein—

Figure 1 shows a front elevation of a boiler having my invention installed in connection therewith, the carbon-separating tank being shown in vertical section; Fig. 2 is a plan-view of the apparatus, parts being shown in section on the plane 2, the last section of the top next the delivery-end being removed to exhibit the interior; Fig. 3 is a longitudinal section therethrough on the plane 3; Fig. 4 is a longitudinal fragmentary section on the plane 4 on a larger scale; and Fig. 5 is a transverse section of one side of the tunnel or smoke-flue on the plane 5.

I have herein shown, Fig. 1, a conventional boiler *a*, which may be of any design, shape or dimensions whatever, the combustion-chamber or smoke-passages of which are connected by a vertical flue *b* to the breeching *c*, which carries the combustion-gases to the stack or otherwise disposes thereof. In the flue *b* is a cut-off slide or damper *d*, whereby the passage of the gases through the flue *d* may be intercepted, which will be the case whenever my apparatus is operating.

The principal part of the apparatus constituting my invention comprises the horizontal smoke-flue or tunnel *e*, which is conveniently as herein shown disposed in a loop upon the top of the boiler, one end thereof connecting with the flue *b* through a side-opening therein, and the other with the breeching *c* through a vertical flue *f*. Instead of this disposition it will be often found more convenient or economical to dispose the horizontal flue or tunnel in a straight line or otherwise, or as a substitute for example for the breeching *c*, where it serves a battery of boilers.

The smoke-tunnel *e* is made with a trough-shaped bottom *g* and a dome-shaped top *h*, which is made in sections removable from the trough *g*. The top may be conveniently secured to the bottom by hook-bolts *i*, which engage the edges of the trough *g*. Said trough *g* is designed to hold a sheet of water which extends from one end thereof to the other; this water being prevented from running into the flue *b* by a dam *j* at one end

and kept at a fixed level by a weir at the other end, said weir being preferably made in two parts, to wit: a stationary part *k* and a movable part *l*. The movable part *l* is a plate which rests against the stationary portion *k* and whose upper horizontal edge extends above the latter, and it is attached to the lower end of a screw-stem *m*, which passes upward through the top of the tunnel, and there is threaded to receive a hand-nut *n*, by turning which the movable weir *l* may be adjusted up or down, so as to raise or lower the level of the liquid in the trough *g*. Said liquid is supplied through a supply-pipe *o*. On passing over the weir *l*, the liquid with its surface-load of carbon-dust falls into a discharge-conduit *p*, down which it runs into a separator-tank *q*. Swinging-valves *r* may be provided in this conduit to prevent air from entering the flue therethrough.

I have found that owing to the nature of the carbon-dust carried by the gases of combustion, it has a greater affinity for oil than for water, whereby a greater portion of the carbon can be collected by using oil instead of water to fill the trough *g*. However, as this method may be unnecessarily wasteful of oil, I may also use the improved means shown in the drawing, which will effect the same purpose, and with no waste of oil. Said means comprises an oil-reservoir *s* mounted upon the tunnel *e* at the entry-end thereof, and having a feeding-device adapted to drop oil at a fixed rate into the trough *g*. In this case water is used in said trough, and the oil is dropped upon the surface of the water, immediately spreading so as to form a film thereon, and this film serves to attract and hold the carbon-dust. To prevent the film spreading unduly to the walls and roof of the tunnel, I may provide, if necessary, guard-plates *t* at the sides of the channel, but a slight distance away from the walls thereof, and said guard-plates separate the oil-film at the surface from the walls, but may be open below the water-level as shown at *t'*. These guard-plates end preferably a short distance away from the weir *l*, as indicated in Figs. 2 and 5, so that the water in the space outside them is continually renewed like that in the space between them.

As a separating-device whereby the carbon and oil are separated from the water, I may employ any suitable arrangement, of which that shown in Fig. 1 of the drawings is one example. This is a tank divided transversely at an intermediate elevation by a partition of filtering material *u*, and for this purpose any of the known forms of filter may be used. The water passes through said filtering material *u*, and the filtered water is removed from the tank by a pump *v*, which pumps it through a pipe *w* either into the boiler directly, or other preheating devices may be interposed, if desired.

In order to govern the inflow of water into the device in accordance with the rate at which it is removed from the reservoir *q*, an automatic valve *x* may be inserted in the feed-pipe *o* and connected by a lever *x'* and links x^2 to a float x^3 resting on the surface of the water in the tank *q*. x^4 indicates a shield or guard to prevent the movement of the float from being clogged by the solid contents of the tank. I may also provide upon the sections of the top *h* of the tunnel a plurality of downwardly extending plates *y*, which serve to deflect the gases, and bring them into more immediate contact with the liquid, and further produce eddies in the gases which cause the throwing out of the carbon into the liquid and upon the walls and roof of the tunnel. The plates *y* may be curved at the lower end as indicated at *y'*.

The combustion-gases being shut off from the flue *b* by the damper *d*, are forced to travel through the tunnel *e*, where they deposit the greater portion of their unburned carbon or soot which they carry upon the surface of the liquid in the trough. At the same time, the gases heat the water and have a large part of their own waste heat thus abstracted and untilized in the manner aforesaid. Where oil is used, according to my improved method hereinabove described, only sufficient is dropped upon the surface of the water to be entirely absorbed and held by the carbon, so that the latter is easily gathered into a compact mass on reaching the tank *q*, and separates itself from the water without difficulty. To prepare the carbon for market, it may be degreased by heating to redness.

I wish it understood that my invention is not limited to the use of all the above described features and constructions, for some may be omitted and others may be varied or modified in various ways, as will readily occur to those skilled in the art.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A device for removing smoke from gases comprising an inclosed tunnel through which the gases are adapted to be passed and adapted to carry a layer of liquid on the floor thereof, means for feeding a continuous supply of liquid in at one end, oil supplying means, means for separating the oil film at the surface from the walls and means for regulating the discharge of the liquid at the other end.

2. A device for removing smoke from gases comprising an inclosed horizontal tunnel through which the gases are adapted to be passed and adapted to carry a layer of

liquid on the floor thereof, means for feeding a continuous supply of liquid in at one end, oil supplying means, means for separating the oil film at the surface from the walls and a weir at the other end regulating the level of the surface of the liquid.

3. A device for removing smoke from gases comprising an inclosed horizontal tunnel through which the gases are adapted to be passed and adapted to carry a layer of liquid on the floor thereof, means for feeding a continuous supply of liquid in at one end, oil supplying means, means for separating the oil film at the surface from the walls, a movable weir at the other end regulating the level of the surface of the liquid, and means for raising and lowering said weir.

4. A device for removing smoke from gases comprising an inclosed tunnel through which the gases are adapted to be passed and the bottom of which is adapted to receive a layer of liquid, means for supplying liquid at one end and removing it at the other end, means for spreading a film of oil on the surface of said liquid, and a pair of guard-plates on the opposite sides of said tunnel extending above the surface of the liquid parallel to and a little distance from the walls of the tunnel to separate the oil-film at the surface from the walls.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

HENRY J. DELANEY.

Witnesses:
S. H. Hoff,
Frank E. Geilfuss.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."