

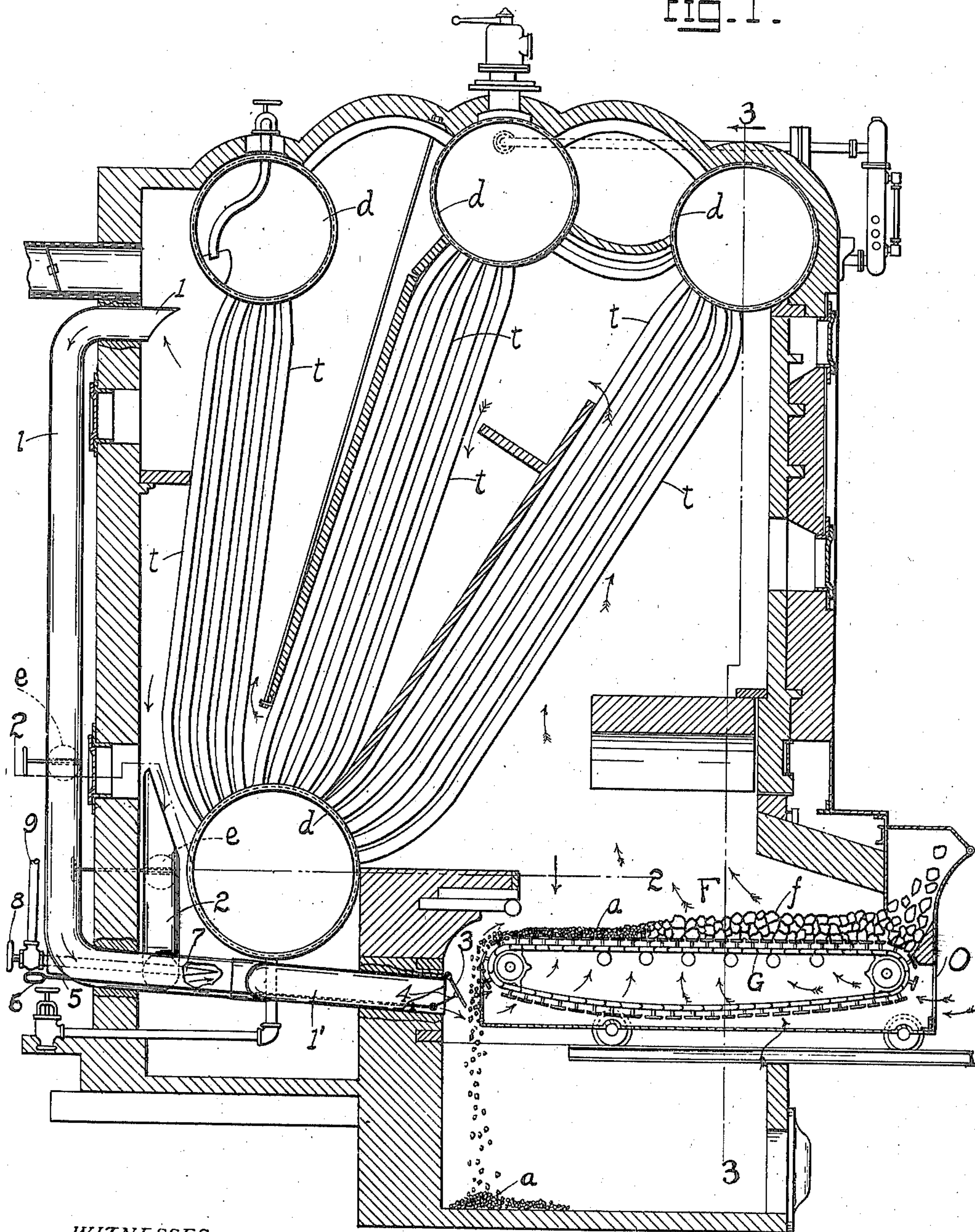
L. DUFFNER.
 MEANS FOR CONTROLLING DRAFT AIR TO BOILER FURNACES.
 APPLICATION FILED MAY 5, 1909.

947,804.

Patented Feb. 1, 1910.

2 SHEETS—SHEET 1.

FIG. I.



WITNESSES:

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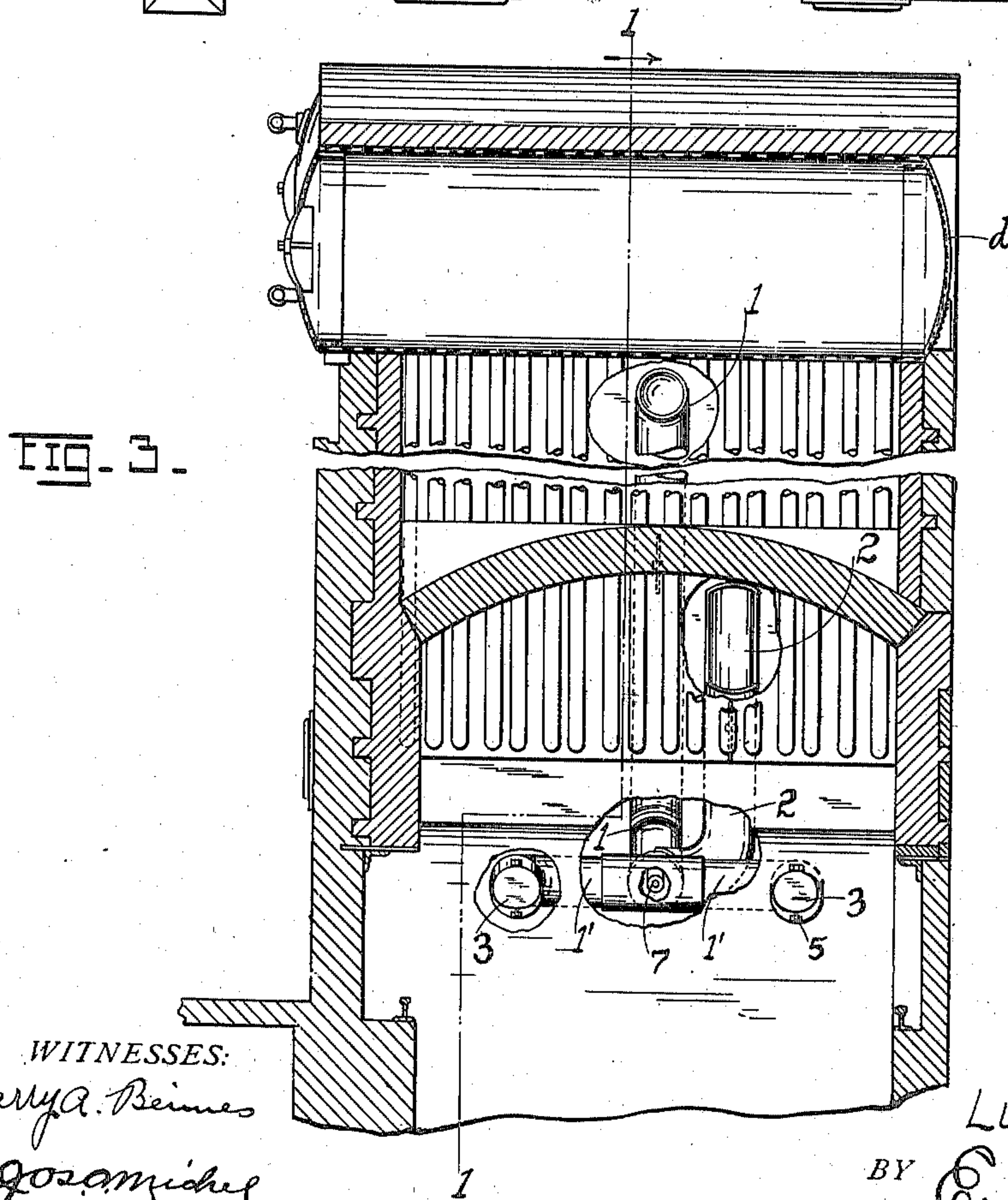
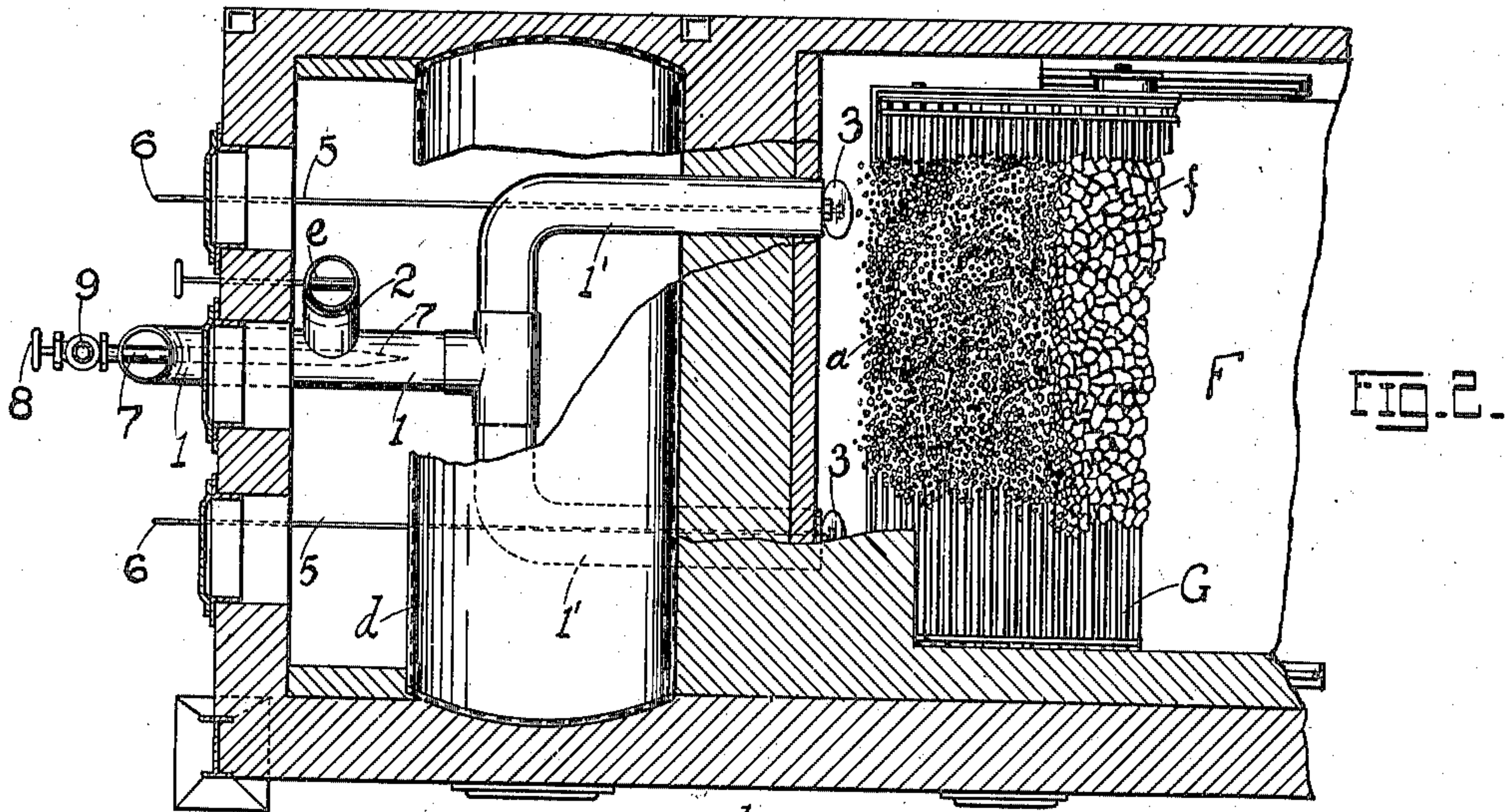
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MEANS FOR CONTROLLING DRAFT AIR TO BOILER FURNACES.

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2 SHEETS--SHEET 2.



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MEANS FOR CONTROLLING DRAFT-AIR TO BOILER-FURNACES.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, LUCAS DUFFNER, a citizen of the United States, residing at St. Louis, State of Missouri, have invented certain new and useful Improvements in Means for Controlling Draft-Air to Boiler-Furnaces, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

My invention has relation to improvements in means for controlling the distribution of draft-air to boiler furnaces; and it consists in the novel construction and arrangement of parts more fully set forth in the specification and pointed out in the claims.

In the drawings, Figure 1 is a vertical longitudinal section of a conventional sectional boiler on the line 1—1 of Fig. 3, showing my invention applied thereto; Fig. 2 is a horizontal section on the line 2—2 of Fig. 1 parts being broken away; and Fig. 3 is a vertical transverse section on the line 3—3 of Fig. 1, the chain-grate however, being removed, and other parts broken.

In the feeding of air to boiler furnaces employing mechanical stokers and chain-grates whereby the fuel is automatically advanced from the front of the fire-box to the rear thereof, a considerable volume of the air admitted to the fuel resting on such a grate passes through the ash or residuum portion of the fuel confined to the rear end of the grate, the comparatively slight resistance of such ash to the inflowing air current permitting the latter to pass freely therethrough into contact with the boiler thereby subjecting the boiler to undue cooling by the impact of the cool air against the boiler tubes or shell.

It is the object of my invention to utilize a part of the combustion products, diverting the same before they pass into the escape flue and lead them back into the space beneath that portion of the grate on which the ashes are supported, these products not only flowing into such space in opposition to the direction of flow of the cool air current, but their high temperature serving to materially heat the inflowing air so that the cooling of the boiler is effectively prevented. Moreover by varying the velocity of influx of such opposing current of hot gases the grate area over which the cold inflowing air intended to support combustion, shall

distribute itself may be accurately controlled so that the air shall contact only with those portions of the fuel which are not fully consumed, leaving only the hot furnace gases to pass up through the pervious layer of ashes, so that the danger of injurious cooling of the boiler is entirely eliminated.

The invention may of course be applied to any boiler furnace, and in the present instance I illustrate the same in connection with a sectional boiler of the Sterling type provided with a chain grate of conventional design.

The advantages of the invention will be best apparent from a detailed description thereof which is as follows:—

Referring to the drawings, *d* represents a series of drums connected by water tubes *t* forming conjointly a sectional boiler of the water-tube type, that shown being the conventional Sterling boiler. Such features as may be shown but to which no reference is made are well known and require no description in the present connection. Mounted at the feed end of the furnace is a chain-grate *G*, which automatically advances the fuel from the front to the rear of the fire-box *F*, and in ordinary cases the fuel *f* remains unconsumed over approximately two-thirds the area of the top of the grate, the rear third being covered with ashes *a*. The ash layer is not only thinner than the fuel layer but is considerably more pervious to the air which passes upward through the front opening *O*, through the grate to support the combustion of the fuel charge resting on the grate. Of course, the air thus admitted to the grate furnishes the necessary oxygen for supporting combustion, but a considerable portion of the air will pass freely through the thin pervious layer of ashes *a* before any considerable heating of such air can take place, and the comparatively cool air will thus pass through the ashes into the combustion chamber and against the boiler, thereby unduly cooling the same. By the use of my invention the portion of the air which would otherwise pass through the thin ash layer will be deflected or crowded toward the front portion of the grate or under the fuel-charge, and hence the deleterious effects of the cooling of the boiler is prevented.

The invention consists in utilizing the hot furnace gases to assist the general draft of the boiler, but in such a way that only these

hot gases (and not the cool air) may come in contact with the boiler.

Leading from the rear of the top of the combustion chamber is a return flue 1 which enters behind and below the bottom drum of the boiler, being tapped behind such drum by a branch intake-flue 2. Leading finally from the inner lower end of the flue 1 are branches 1', 1', which discharge at convenient points behind the rear end of the chain-grate G. The flues 1 and 2 are provided with ordinary dampers *e* not necessary to describe in detail as they are common and well understood. The branches 1', 1' are provided at their discharge ends with hinge-valves or dampers 3, each damper being coupled through a link 4 to an operating rod 5 passing through and out of the branch, and terminating in a handle or finger hold 6. Tapping the lower portion of the flue 1 is a steam nozzle or injector 7 controlled by a valve 8, the steam being supplied thereto by a steam-pipe 9 which takes its supply either from the boiler or any other convenient source of supply.

By a proper manipulation of the dampers *e*, *e*, a portion of the combustion products may be drawn from either the upper or lower part of the combustion chamber, and by means of the steam jet be projected past the valve 3 into the space below that section of the grate occupied by the layer of ashes *a*. Thus, an opposing hot gaseous current will flow into the space below the grate, preventing the inflowing cold air from reaching a point beyond the rear edge of the unconsumed fuel-charge, the opposing gaseous current confining the air to the front of the grate, while the hot gases are free to pass through the layer of ashes *a* into the combustion chamber, where in contacting with the boiler no deleterious effects can result.

Since the area occupied by the ashes *a* will vary with different kinds of fuel, and with the velocity at which the chain-grate may travel, the force with which the hot gases may be projected in opposition to the incoming air currents may be carefully reg-

ulated not only by a proper adjustment of the valve 8, but by regulating the position of the damper 3. In Fig. 1, the air is shown by the feathered arrows, and the hot gases by plain arrows, illustrating how the air is confined in its flow to that portion of the grate occupied by the unconsumed fuel-charge *f*.

Having described my invention, what I claim is:

1. In combination with a boiler furnace provided with a fire-box and a combustion chamber, a grate for supporting and advancing the fuel toward the combustion chamber, means for admitting atmospheric air beneath the front of the grate, a flue leading from the combustion chamber for returning and discharging a portion of the hot combustion products along the bottom of the rear of the grate and in a direction opposed to the general direction of flow of the atmospheric air, and a jet nozzle for projecting the returned combustion products under the section of the grate occupied by the ashes, substantially as set forth.

2. In combination with a boiler furnace provided with a fire-box and a combustion chamber, a chain grate for supporting the fuel and advancing the consumed portions thereof rearwardly, means for admitting atmospheric air beneath the front of the grate, a flue leading from the combustion chamber for returning and discharging a portion of the hot combustion products along the bottom of the rear of the grate and in a direction opposed to the general direction of flow of the atmospheric air, means for projecting the returned combustion products under the entire section of the grate occupied by the ashes, and dampers for controlling the products so projected, substantially as set forth.

In testimony whereof I affix my signature, in presence of two witnesses.

LUCAS DUFFNER.

Witnesses:

ERNST STAREN,
JOS. A. MICHEL.