

No. 847,425.

PATENTED MAR. 19, 1907.

J. MILLER.

COMBINED WATER HEATER, SMOKE AND GAS CONSUMER, AND DAMPER  
REGULATOR.

APPLICATION FILED FEB. 21, 1906.

3 SHEETS—SHEET 1.

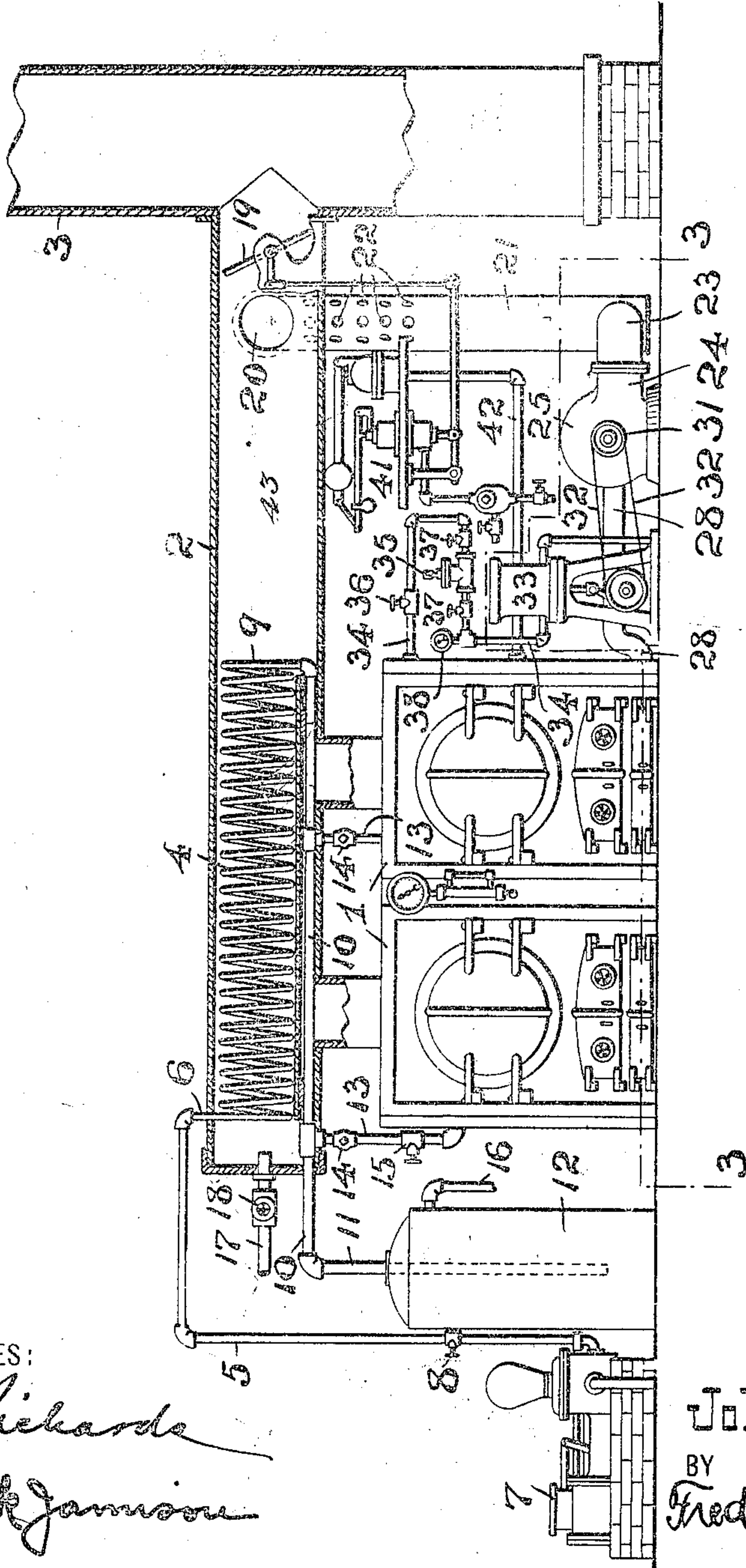


Fig. 1

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*Fredrick Jamison*

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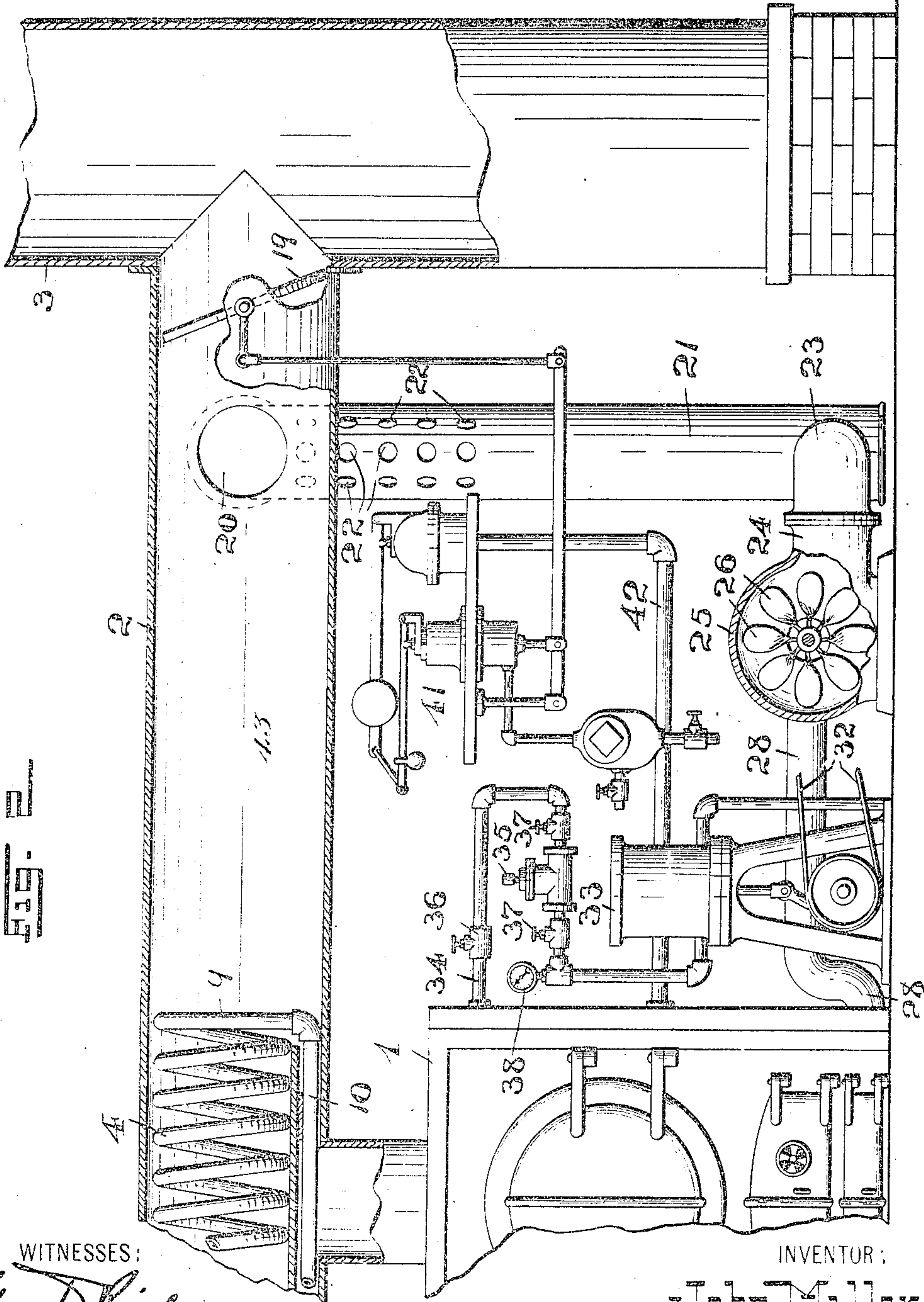


Fig. 2.

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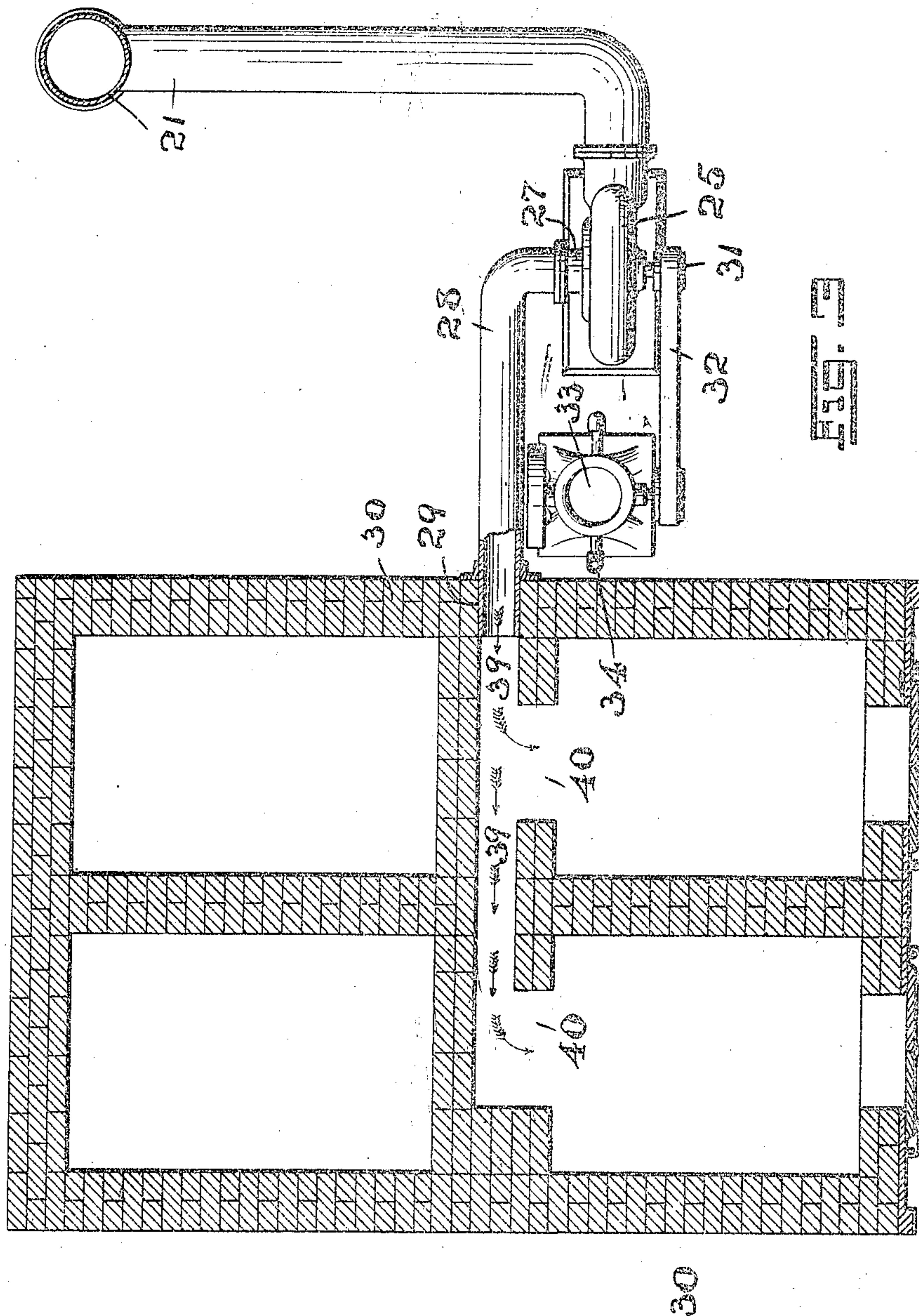
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3 SHEETS—SHEET 3.



WITNESSES:  
*Geo. D. Richards*  
*Frederick Jamison*

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# UNITED STATES PATENT OFFICE.

JOHN MILLER, OF ORANGE, NEW JERSEY.

COMBINED WATER-HEATER, SMOKE AND GAS CONSUMER, AND DAMPER-REGULATOR.

No. 847,425.

Specification of Letters Patent.

Patented March 19, 1907.

Application filed February 21, 1906. Serial No. 302,186.

*To all whom it may concern:*

Be it known that I, JOHN MILLER, a citizen of the United States, residing at Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in a Combined Water-Heater, Smoke and Gas Consumer, and Damper-Regulator; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

The present invention relates to a novel system and arrangement of devices which are to be used with a boiler or boilers for the purpose of producing a combined water-heater, smoke and gas consumer, and damper-regulator; and the invention has for its principal object to provide, in connection with a steam-boiler furnace and the smoke-flue and a damper in said flue, a novel arrangement and combination of devices comprising, in addition to those just enumerated, a return-flue communicating with the smoke-flue on the ingress side of the damper and leading to a point below the grate of the furnace, an exhauster for said return-flue, a water-heating coil situated within said smoke-flue between the furnace and the return-flue, and automatic means for opening and closing the damper correspondingly and governing the rate of motion of said exhauster inversely as the boiler-pressure falls below or rises above a predetermined degree, all arranged with a view of preheating the feed-water and at the same time drawing the smoke and gases from the smoke-flue to beneath the fire of the boiler, where they are consumed to increase the heat and efficiency of the fire.

The invention consists in the novel arrangements and combinations of devices and parts, as well as in the details of the construction of the same, all of which will be more particularly described in the following specification and then finally embodied in the clauses of the claim, which are appended to and which form an essential part of said specification.

The invention is illustrated in the accompanying drawings, in which—

Figure 1 is a front view of a pair of boilers

with their smoke-flue shown in longitudinal vertical section and a representation in elevation of one arrangement or system of devices and parts embodying the principles of the combined feed-water heater, smoke and gas consumer, and damper or draft regulator; and Fig. 2 is a similar view of the said devices and parts, made on an enlarged scale, said view showing, however, only a portion of the one boiler, the smoke-flue, and the feed-water-heating coil therein. Fig. 3 is a horizontal section, said section being taken on line 3 3 in Fig. 1 and being made on a slightly-increased scale.

Similar characters of reference are employed in the said above-described views to indicate corresponding parts.

Referring now to the several figures of the drawings, the reference character 1 indicates one of more boilers of any known construction, and 2 is a smoke-flue arranged between the boiler or boilers and a stack 3. Suitably arranged within the said smoke-flue 2, preferably in the manner shown in the said Letters Patent No. 799,864, hereinabove mentioned, is a coil 4. The feed-water to be preheated is forced into and through the heating-coil 4 from a pipe 5, connected at one end with the inlet 6 of the coil and attached at its other end to a force-pump 7 or other suitable mechanism for forcing water into and through the pipe 5 to be heated in said coil 4. A valve 8 may be placed in the pipe 5, as shown. Connected with the outlet end 9 of the coil 4 is a return-pipe 10, which leads to the end of the flue 2 and extends therefrom, the said pipe 10 terminating in a discharge or outlet pipe 11, which extends into a receiving-tank 12, and the said pipe 11 leading to a point near the inner lower portion of said tank, substantially in the manner indicated in dotted outline in Fig. 1 of the drawings. Connected with the said pipe 11 are suitable feed-pipes 13, each pipe 13 being connected with a boiler and each pipe 13 being also provided with a suitable check-valve 14 and ordinary hand-valve 15. A pipe 16 may lead from the receptacle or tank 12 to any other part outside of the boiler or boilers for conducting the water to any other point desired. To remove any soot or other foreign matter from the said coil 4, a pipe 17 is connected with an end or other portion of the flue from which steam or other mat-



ter, such as compressed air, can be forced into said flue and between the members of the coil for the purpose of keeping the coil clean, as will be clearly evident. A valve 18 may  
5 be placed in said pipe 17, if desired. In every instance the said flue 2 is provided at any suitable point between the one end of the said coil 4 and the point of connection of the flue 2 with the stack 3 with a damper 19,  
10 and in order to retain as much heat as possible within the flue 2, so that the water which passes through the coil 4 is readily and quickly heated, it is very desirable that this damper be maintained in its closed position  
15 as much as possible.

The flue 2 is provided upon the ingress side of the damper with an opening 20, with which is connected a return flue or pipe 21, said flue or pipe being provided with a series  
20 of air-inlets 22 and having a portion 23, which is connected to an inlet 24 of a suitable exhaust-fan 25, which is provided with desirably-formed rotating exhaust or fan blades 26. Said exhauster 25 has an outlet  
25 27, with which is connected a duct or pipe 28, terminating at its opposite end in an inlet 29, formed in the wall or foundation 30 of the boiler setting. The shaft of the exhauster, which carries the exhaust or fan blades 26, is  
30 provided with a pulley 31, which is driven, by means of a belt 32, from any suitable prime mover. In the present case I employ a small steam-engine 33, as shown, which receives steam from one of the boilers through a pipe  
35 34. In this pipe I have placed any suitably-constructed and automatically-operating steam-regulator, as 35, suitable valves 36 and 37 and a steam-gage 38 being also preferably placed in said pipe 34, and the  
40 purposes of which are evident. Thus it will be clearly seen that when the fan-blades 26 of the exhauster 25 are set in motion by means of said engine 33, or other suitable  
45 prime mover some of the smoke and gases that may be in the flue 2 will be drawn through the opening 20 into the return-flue pipe or duct 21 and through the shell or casing of the exhauster 25 into the pipe or duct 28  
50 and the passages 39 and 40 directly beneath the fire-grates of the boilers, as will be clearly understood from an inspection of the several figures of the drawings. At the same time a  
55 sufficient supply of fresh air is drawn into the pipe or duct 21 through the openings 22 to become mixed with the smoke and gases and thereby produces a combustible mixture which is readily burnt or consumed by the fire upon the grate or grates.

The steam-pressure regulator 35 is automatic in its action and regulates the actions  
60 of the steam-engine 33 to cause the engine to regulate the rotary movements of the parts of the exhauster, as will presently appear. The movements of the damper 19 are also  
65 automatically controlled, so as to regulate

the open and closed positions of the damper by means of any well-known construction of the damper and pressure regulator, as 41, which is connected with one of the boilers by means of a steam-pipe 42, substantially as  
70 illustrated in Figs. 1 and 2 of the drawings. The arrangement and constructions of the parts of the said damper-regulator are such that when the steam-pressure becomes low-  
75 ered the damper is forced into its opened relation in the flue 2. This produces a strong draft which raises the steam and causes the engine 33 to run faster. Consequently the  
80 exhauster 25 will work faster and help to fan the fire beneath the boiler. As soon as the steam-pressure has been raised the damper will again become closed and the exhauster  
85 will be made to work much slower, with the result that the smoke and gases instead of passing out into the stack 3 will be brought back under the grate or grates, as herein-  
above mentioned, and will be consumed and thereby provide an increased heat.

It will thus be seen from the foregoing description that a simple arrangement or com-  
90 bination of elements has been produced by which not only the quantity of the gases returned to the combustion-chamber is regulated, but the velocity of the motor is at the  
95 same time automatically controlled inversely as the boiler-pressure rises above or falls below a predetermined degree, the said devices  
and parts cooperating to produce a constant  
100 circulation of the heated gases in operative contact with the water-heating coils at all the times and also automatically governing the rate of combustion.

I claim—

1. The combination of a steam-boiler furnace, a smoke-flue, a damper in said smoke-  
105 flue, a return-flue communicating with said smoke-flue on the ingress side of said damper, and leading to a point below the grate of said furnace, an exhauster for said return-  
110 flue, a water-heating coil situated within said smoke-flue between the furnace and the return-flue, and automatic means for opening and closing said damper correspondingly,  
and for governing the rate of motion of said  
115 exhauster inversely, as the boiler-pressure falls below or rises above a predetermined degree, substantially as and for the purposes set forth.

2. The combination of a steam-boiler furnace, a smoke-flue, a damper in said smoke-  
120 flue, a return-flue communicating with said smoke-flue on the ingress side of said damper, and leading to a point below the grate of said furnace, an exhauster for said return-  
125 flue, a water-heating coil situated within said smoke-flue between the furnace and the return-flue, and automatic means for opening and closing said damper correspondingly,  
and for governing the rate of motion of said  
130 exhauster inversely, as the boiler-pressure



falls below or rises above a predetermined degree, consisting of a steam-engine, a steam connection between said engine and boiler, a pressure-regulator in said steam connection, and a driving means between said steam-engine and the exhauster, substantially as and for the purposes set forth.

3. The combination of a steam-boiler furnace, a smoke-flue, a damper in said smoke-flue, a return-flue communicating with said smoke-flue on the ingress side of said damper, and leading to a point below the grate of said furnace, an exhauster for said return-flue, a water-heating coil situated within said smoke-flue between the furnace and the return-flue, said coil having an inlet and an outlet, a pipe connected with said inlet, a pump connected with said pipe, a second pipe connected with said outlet of the coil, and a feed-pipe connected with said second pipe and the boiler for feeding the preheated water into the boiler, and automatic means for opening and closing said damper correspondingly, and for governing the rate of motion of said exhauster inversely, as the boiler-pressure falls below or rises above a predetermined degree, substantially as and for the purposes set forth.

4. The combination of a steam-boiler furnace, a smoke-flue, a damper in said smoke-flue, a return-flue communicating with said smoke-flue on the ingress side of said damper, and leading to a point below the grate of said furnace, an exhauster for said return-flue, a water-heating coil situated within said smoke-flue between the furnace and the return-flue, said coil having an inlet and an outlet, a pipe connected with said inlet, a pump connected with said pipe, a second pipe connected with said outlet of the coil, and a feed-pipe connected with said second pipe and the boiler for feeding the preheated water into the boiler, and automatic means for opening and closing said damper correspondingly, and for governing the rate of motion of said exhauster inversely, as the boiler-pressure falls below or rises above a predetermined degree, consisting of a steam-engine, a steam connection between said engine and boiler, a pressure-regulator in said steam connection, and a driving means between said steam-engine and the exhauster, substantially as and for the purposes set forth.

5. The combination of a steam-boiler furnace, a smoke-flue, a damper in said smoke-flue, a return-flue communicating with said smoke-flue on the ingress side of said damper, and leading to a point below the grate of said furnace, said return-flue being provided with a means for conducting air into the same, an exhauster for said return-flue, a water-heating coil situated within said smoke-flue between the furnace and the return-flue, and automatic means for opening and closing said damper correspondingly,

and for governing the rate of motion of said exhauster inversely, as the boiler-pressure falls below or rises above a predetermined degree, substantially as and for the purposes set forth.

6. The combination of a steam-boiler furnace, a smoke-flue, a damper in said smoke-flue, a return-flue communicating with said smoke-flue on the ingress side of said damper, and leading to a point below the grate of said furnace, said return-flue being provided with a means for conducting air into the same, an exhauster for said return-flue, a water-heating coil situated within said smoke-flue between the furnace and the return-flue, and automatic means for opening and closing said damper correspondingly, and for governing the rate of motion of said exhauster inversely, as the boiler-pressure falls below or rises above a predetermined degree, consisting of a steam-engine, a steam connection between said engine and boiler, a pressure-regulator in said steam connection, and a driving means between said steam-engine and the exhauster, substantially as and for the purposes set forth.

7. The combination of a steam-boiler furnace, a smoke-flue, a damper in said smoke-flue, a return-flue communicating with said smoke-flue on the ingress side of said damper, and leading to a point below the grate of said furnace, said return-flue being provided with a means for conducting air into the same, an exhauster for said return-flue, a water-heating coil situated within said smoke-flue between the furnace and the return-flue, said coil having an inlet and an outlet, a pipe connected with said inlet, a pump connected with said pipe, a second pipe connected with said outlet of the coil, and a feed-pipe connected with said second pipe and the boiler for feeding the preheated water into the boiler, and automatic means for opening and closing said damper correspondingly, and for governing the rate of motion of said exhauster inversely, as the boiler-pressure falls below or rises above a predetermined degree, substantially as and for the purposes set forth.

8. The combination of a steam-boiler furnace, a smoke-flue, a damper in said smoke-flue, a return-flue communicating with said smoke-flue on the ingress side of said damper, and leading to a point below the grate of said furnace, said return-flue being provided with a means for conducting air into the same, an exhauster for said return-flue, a water-heating coil situated within said smoke-flue between the furnace and the return-flue, said coil having an inlet and an outlet, a pipe connected with said inlet, a pump connected with said pipe, a second pipe connected with said outlet of the coil, and a feed-pipe connected with said second pipe and the boiler for feeding the preheated water into



the boiler, and automatic means for opening and closing said damper correspondingly, and for governing the rate of motion of said exhauster inversely, as the boiler-pressure falls below or rises above a predetermined degree, consisting of a steam-engine, a steam connection between said engine and boiler, a pressure-regulator in said steam connection, and a driving means between said steam-

engine and the exhauster, substantially as recited and for the purposes set forth.

In testimony that I claim the invention set forth above I have hereunto set my hand this 15th day of February, 1906.

JOHN MILLER.

Witnesses:

FREDK. C. FRAENTZEL,  
GEO. D. RICHARDS.