

(No Model.)

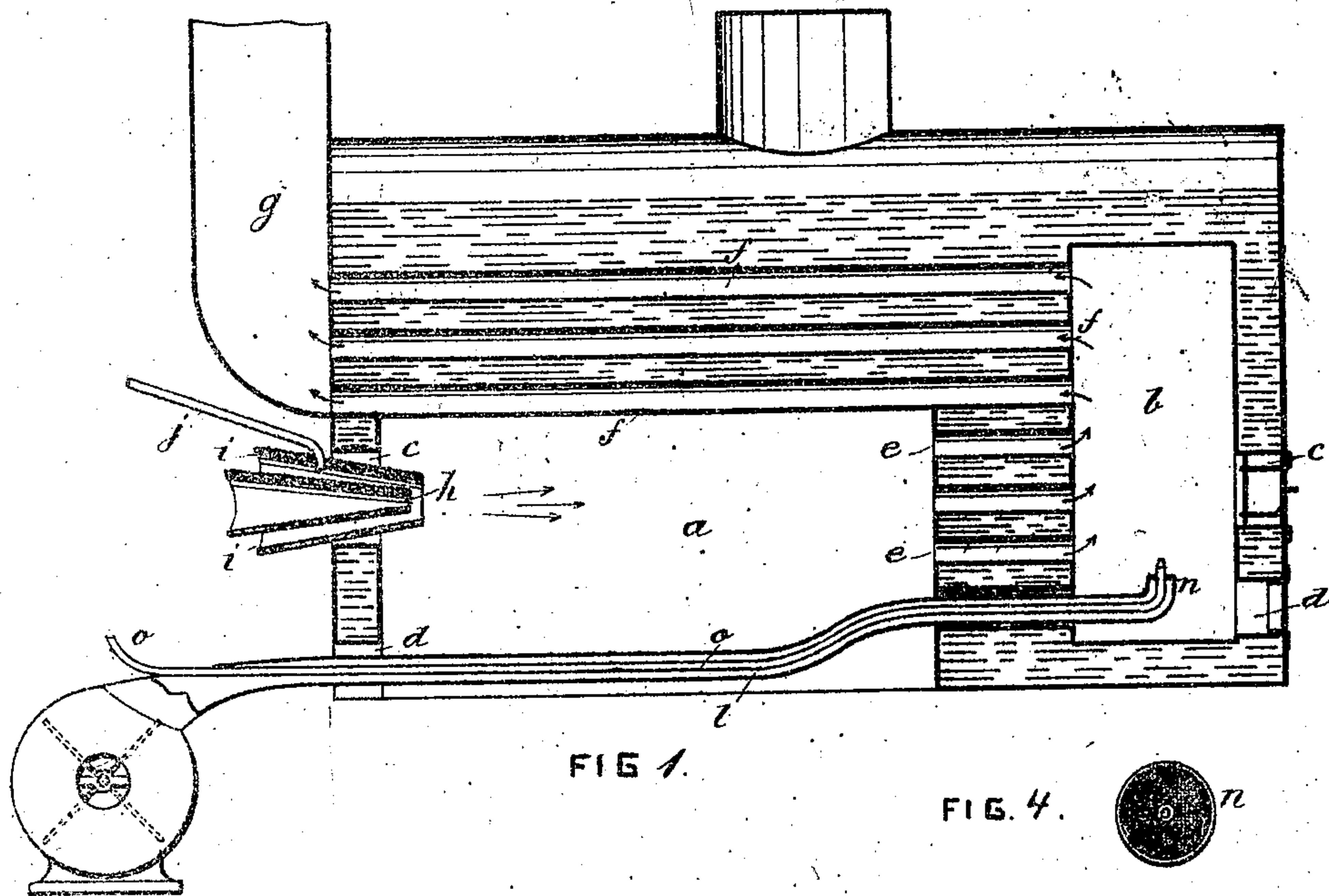
2 Sheets—Sheet 1.

J. WILSON & A. MASON.

PROCESS OR METHOD OF MAINTAINING COMBUSTION IN SECONDARY  
CHAMBERS OF BOILER OR OTHER FURNACES.

No. 438,872.

Patented Oct. 21, 1890.



WITNESSES

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INVENTORS

John Wilson  
Allen Mason  
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FIG. 2.

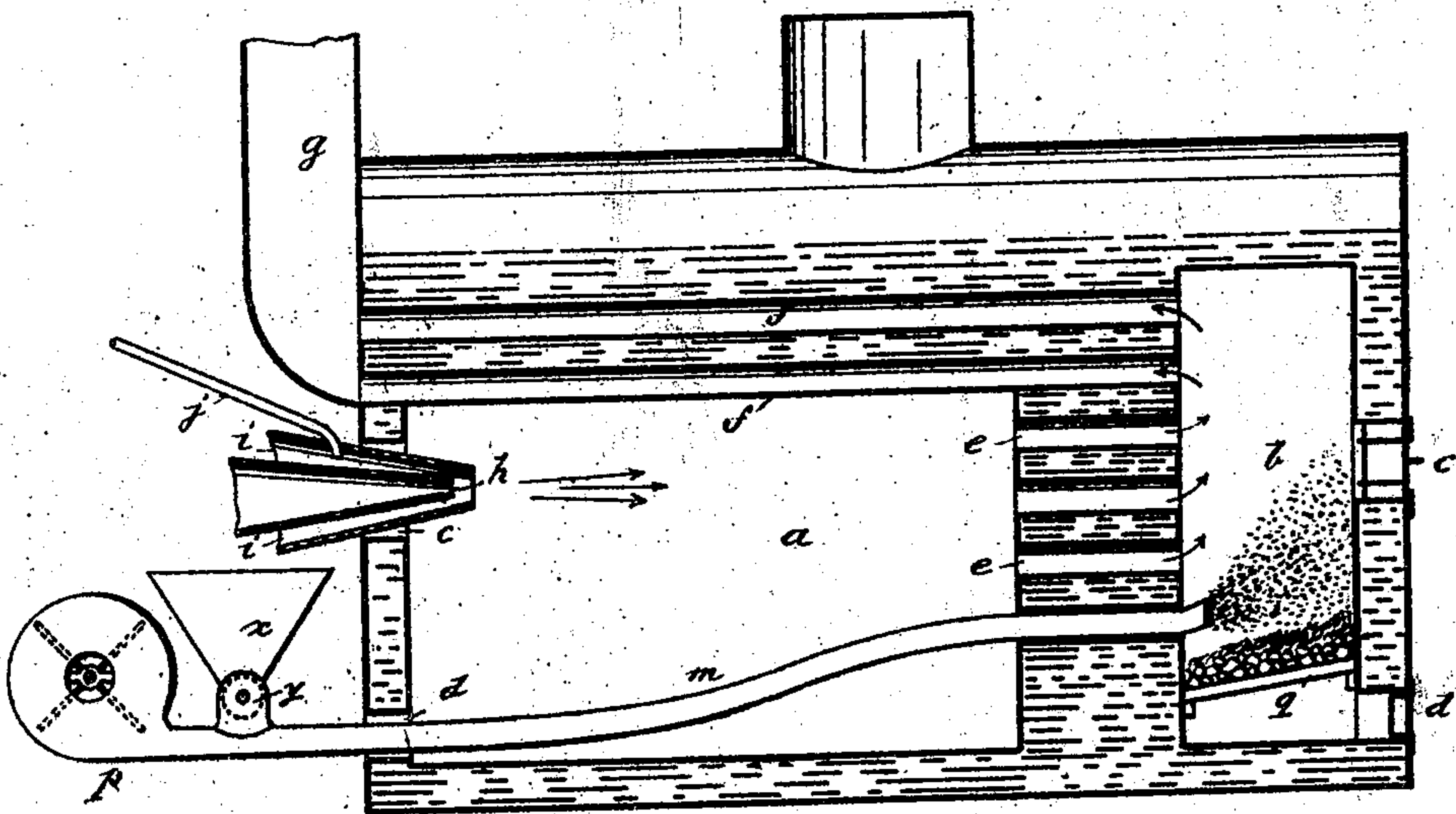
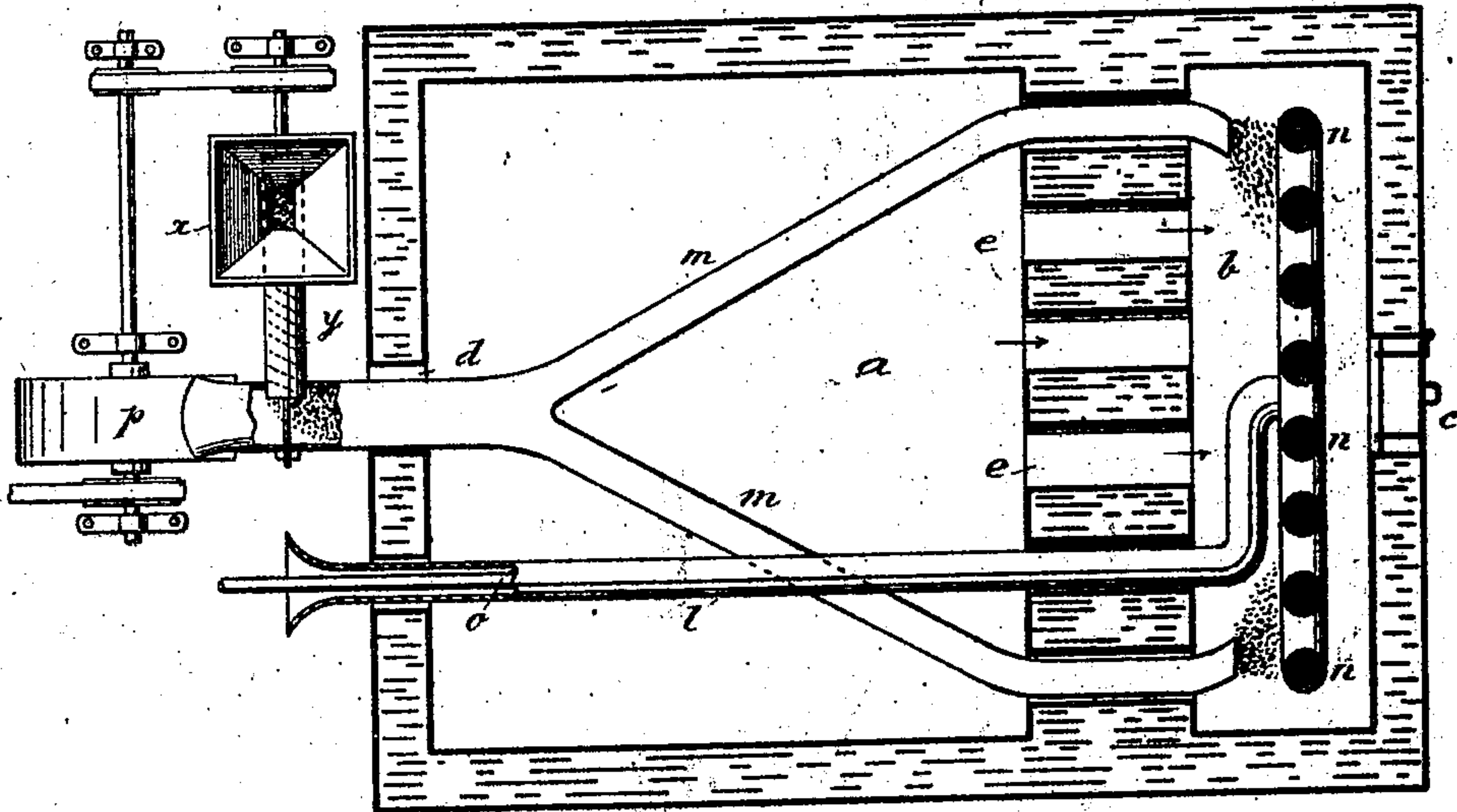


FIG. 3.

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# UNITED STATES PATENT OFFICE.

JOHN WILSON, OF NEW YORK, AND ALLAN MASON, OF BROOKLYN, ASSIGNORS  
TO HERBERT H. SANDERSON, TRUSTEE, OF NEW YORK, N. Y.

PROCESS OR METHOD OF MAINTAINING COMBUSTION IN SECONDARY CHAMBERS OF BOILER OR  
OTHER FURNACES.

SPECIFICATION forming part of Letters Patent No. 438,872, dated October 21, 1890.

Application filed December 5, 1887. Serial No. 256,997. (No model.)

*To all whom it may concern:*

Be it known that we, JOHN WILSON and ALLAN MASON, citizens of the United States, residing, respectively, at New York city and Brooklyn, New York, have invented certain new and useful Improvements in the Process or Method of Maintaining Combustion in Secondary Chambers of Boiler and other Furnaces; and we do 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 the letters of reference marked thereon, which form a part of this specification.

Our invention relates to boiler and other furnaces in which one or more secondary combustion-chambers are employed, with the objects of securing more effectual combustion of the gaseous portions of the fuel and more effective application of the heat than are obtained with a single combustion-chamber. It is especially designed for the greater and more economical development of steam in marine and other boilers through the instrumentality of a secondary combustion-chamber at the rear or opposite end from the primary furnace-chamber and communicating with it to receive and consume the unconsumed gases and to return the heat products through the upper portion of the boiler; but our invention is also designed generally for all similar or other furnaces in which secondary combustion may be advantageously utilized, as hereinafter fully described, reference being made to the accompanying drawings, in which—

Figure 1 is a longitudinal sectional elevation of a boiler-furnace, showing the application of an auxiliary hydrocarbon fire in the secondary combustion-chamber for effectual combustion of the gases entering said chamber from the front or primary chamber, in which we have in this instance represented apparatus for the use of hydrocarbon fuel and steam; but coal or gas fuel may be used instead, as preferred. Fig. 2 is a horizontal section of a similar furnace, in which the auxil-

iary fire of the secondary chamber is supported in part by hydrocarbon fuel and in part by coal-slack, both introduced with air, the fire in the front furnace being of coal or other fuel, as preferred. Fig. 3 is a longitudinal sectional elevation of a similar furnace, in which the auxiliary fire in the secondary chamber is maintained with coal-slack-blown in and burned on a coal fire, which, being an ordinary fire made on a coal-grate to begin with, is subsequently maintained and continued by the supply of coal-slack, the fire in the front furnace being produced in this instance with hydrocarbon fuel injected with steam and air. Fig. 4 is a detail of one of the burners of Figs. 1 and 2 in top view and on an enlarged scale.

We are aware that it has been attempted to consume in secondary chambers such gases as fail of complete combustion in the first chamber, it being supposed that, sufficient room being provided, the heat of the primary chamber would be sufficient for effecting such combustion; but we find such method is a failure practically, although it may work at times and under some circumstances; but generally the gases are too much chilled to insure continuous combustion, and when extinguished by fall of temperature or other causes fail to relight even when considerable increase of temperature takes place. Hence we find an auxiliary fire in the secondary chamber an imperative necessity for practical efficiency; but such a fire as is commonly made by intermittent supplies of fuel through the ordinary fire-door will not do, because when the door is opened it stops the draft in both fires, besides admitting cold air in great excess, and therefore materially interferes with both fires; and if a fan-blower is used to urge the main fire, as is commonly the case with marine boilers, the door cannot be opened without first stopping the fan, and the fan also interferes with magazine-feeders and other automatic stokers for the auxiliary fire by forcing more or less gas out through them. To overcome these difficulties and to secure a reliable and uniform auxiliary fire adapted to insure effectual combustion of the unconsumed gases



from the main fire, we have contrived a system which comprises the continued and unobstructed forced supply of the elements of combustion in various forms to the continually-closed secondary chamber in addition to the gases entering it from the main furnace, and in such manner as to accelerate the natural draft of the main furnace and to be alike available with a forced draft thereto, the arrangement being such that the same is controllable at the front, where the main fire is tended, and so that the apparatus is applicable to and detachable from ordinary furnaces constructed with a secondary chamber without change or permanent attachment.

The apparatus which we prefer to use is variable to some extent, at the option of the constructor and for different forms of the combustibles to be used, and is reserved for separate applications for patents.

In the boiler-furnace represented in the drawings, *a* indicates the main or primary combustion-chamber, and *b* the secondary chamber, each having the customary fire-door *c* and ash-pit door *d*, with the usual system of fire-tubes *e* communicating between them, also the return system of tubes *f*, connecting the secondary chamber with the smoke-flue *g*.

In Figs. 1 and 4 we represent an injecting apparatus for the use of oil, steam, and air for combustion in the main furnace, *h* being a steam-nozzle, *i* an air-inlet funnel, and *j* an oil-feeding tube, one or more of the latter being ~~used~~ to deliver oil on the upper surface of the steam nozzle, which may have a groove or grooves to conduct the oil off the end of the nozzle suitably to mix and atomize or vaporize with the steam and air, the steam-nozzle to be suitably connected with the boiler, and the oil pipe or pipes to be connected with any source of supply, with suitable regulating-cocks or other devices, and all being suitably connected with the furnace through the fire-door of the first combustion-chamber. With these methods of producing combustion in the main chamber *a* we provide for an auxiliary fire in the secondary chamber *b* by a series of oil-burners *n*, supplied with oil and air through the ash-pit and one or more of the fire-tubes *e* by the pipes *o* and *l*, and any approved

means of injecting them, with which we may also burn coal-slack, to be forced in through a pipe or pipes *m* by a fan *p* or other means, or we may use the coal-slack with an ordinary coal-fire *q* to begin with and to be subsequently maintained by the coal-slack alone.

While we find it preferable to introduce the fuel into the secondary chamber through the main furnace-chamber, we may of course arrange the conductors to enter through the ash-pit door of the secondary chamber; but it is important to arrange for the control of the injecting apparatus from the front of the furnace, where it may be managed by the attendants of the main furnace.

We are aware that a metallurgic furnace, consisting of a gas-producing chamber and a gas-burning chamber receiving the gas from the first chamber, together with a separate air-injector for each chamber, has been used, the object being to provide in the first chamber a special quantity of fuel for combustion solely in the chamber containing the metal, and we disclaim such method, ours being to burn to the best possible advantage in both chambers in boiler and such furnaces as are adapted for alike utilizing heat from both.

What we claim, and desire to secure by Letters Patent, is—

The improved process of producing and utilizing heat in a boiler or other like furnace, consisting in producing a fire in the ordinary furnace-chamber, introducing the heated products thereof into a locally separate secondary combustion-chamber of said boiler or other furnace, and separately introducing and burning therein a continuous forced supply of other fuel elements, in combination with the products from the primary chamber after being largely cooled by coming in contact with the boiler and while passing from the primary to the secondary chamber, substantially as described.

In testimony whereof we affix our signatures in presence of two witnesses.

JOHN WILSON.  
ALLAN MASON.

Witnesses:

W. J. MORGAN,  
J. J. McDERMOTT.