(No Model.)

J. H. O'HARA.

MEANS FOR PROMOTING COMBUSTION IN FURNACES.

No. 459,017. Patented Sept. 8, 1891.

Fig. 1.

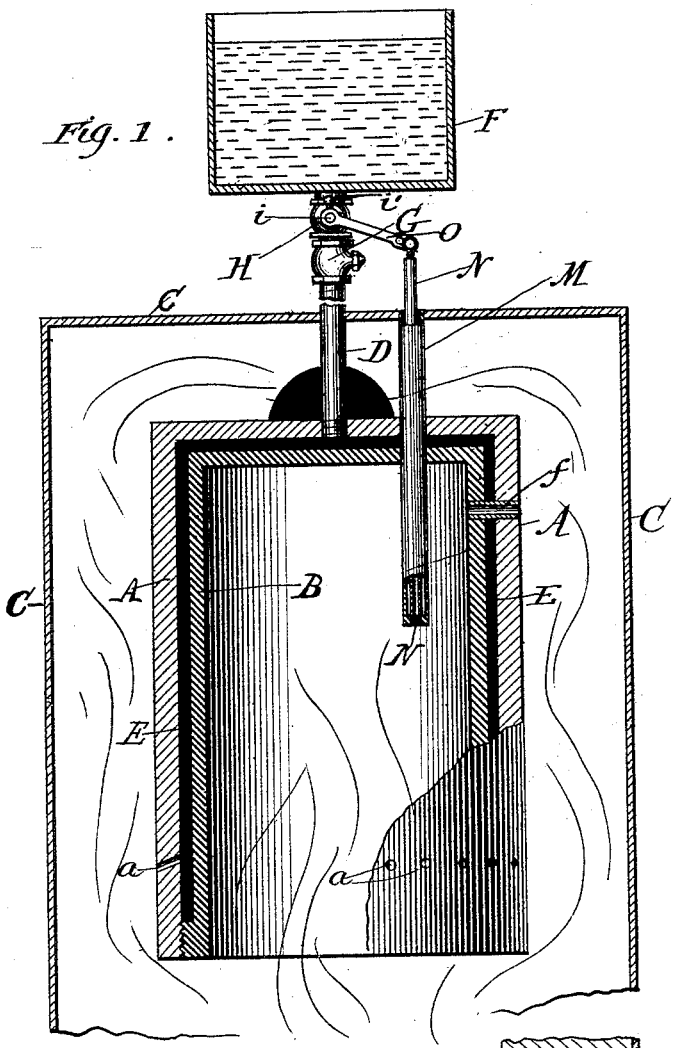
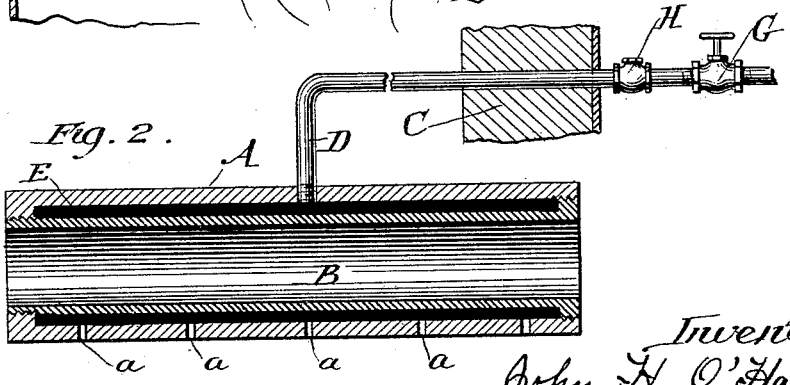


Fig. 2.



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MEANS FOR PROMOTING COMBUSTION IN FURNACES.

SPECIFICATION forming part of Letters Patent No. 459,017, dated September 8, 1891.

Application filed December 8, 1890. Serial No. 373,857. (No model.)

To all whom it may concern:

Be it known that I, JOHN H. O'HARA, a citizen of the United States, residing in Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Means for Promoting Combustion in Furnaces, Stoves, &c., of which the following is a specification.

My invention relates to devices which are designed to produce approximately perfect combustion of the fuel in a furnace or stove by the introduction of water, which, after being converted into steam, is wholly or partially decomposed in its passage to the fuel, so that it will be in the proper state to combine with the gases of combustion and produce effects which will be hereinafter described.

My objects are to provide an apparatus which can be used in any kind of a furnace, whether boiler-furnace or blast-furnace, and derive its water-supply from either a tank placed above the apparatus, or it may draw its supply of water from the ordinary service-pipes, thus making the apparatus independent of any special steam-plant.

Another object is to provide an apparatus for regulating the supply of water, so that it will not continually require the care of an attendant.

I attain these objects by the construction illustrated in the accompanying drawings.

Figure 1 is a sectional view showing the general arrangement of parts as ordinarily constructed and applied to the central or upper part of a stove or furnace or passage-way for the gases of combustion, which have a temperature of not less than 800° Fahrenheit, water being supplied by means of a tank. Fig. 2 shows the apparatus in sectional view, modified to suit the requirements of a locomotive fire-box or any stove having a long narrow furnace.

Similar letters refer to like parts throughout the several views.

In describing the construction and operation of this apparatus I will confine myself more especially to Fig. 1.

A is preferably a cylindrical outer casing, and B a cylindrical inner casing smaller than A, so that a narrow space E is provided between the two casings all around the sides and at the top, as shown. The two casings A and B are firmly attached together at the bottom end, and at *a* is shown a series of small holes through outer casing A into the space E near the lower end. At *f* is a communication from the interior of casing B to the exterior of casing A.

C shows the side and top plates or walls of a furnace-stove or passage for hot gases of combustion. The pipe D is secured into the top of outer casing A and, together with the valve-globes G and H, forms a communication for water from the tank F to the top of space E. The valve-globe G contains any form of valve to act as a check against any undue pressure of steam from space E acting upward through pipe D and into tank F. H contains any ordinary or special form of valve which can be opened or closed by a rotary motion of the valve-stem *i* when the stem *i* is caused to rotate by the action of lever O.

M is a pipe, which passes down through the top of the furnace C and through the top of casings A and B and protruding downward into the inside space of casing B. Secured to the bottom of pipe M is a metal rod or pipe N, which passes upward through pipe M, and the top of N is pivoted to the outer end of valve-stem lever O. There is a small set-screw shown at *i'*, which secures lever O to valve-stem *i*.

In describing the operation of this apparatus, as shown in Fig. 1, it will be understood that the parts A B, which convert the water into steam, hang down into the furnace or passage-way for hot gases. After a fire has been built in the furnace a sufficient time must elapse to heat the lower end of cylinders A and B to at least a "cherry-red" heat, when water can be admitted by loosening set-screw *i'* of lever O. The valve-stem *i* is then free to move, when the exact quantity of water required can be let into space E through pipe D to suit the requirements. Lever O is now firmly secured to valve-stem *i* by set-screw *i'*. When the water reaches the space E at the top of cylinders A and B, it is instantly converted into steam by the heat passing upward into the interior of B. After enough water has been admitted to space E to

form sufficient steam to drive all the air out of space E through holes *a*, the steam in passing downward in space E is highly superheated in contacting with the walls of space E near the lower end, and is thus either partially or wholly decomposed, when it passes out under some pressure through holes *a*, which holes being inclined downward cause the steam to contact with the burning fuel or the gases arising therefrom and form water-gas, which by contact with the air from the grates or from currents of air admitted above the grates is burned, generating an intense heat, into which all free carbon present is converted into carbonic-acid gas, instead of passing out the chimney as smoke.

After the apparatus is once in operation any increase in the heat of the furnace will cause rod N to expand and open wider the valve in globe H and admit more water, so that the heat of the furnace must be regulated by means of its dampers. When the heat of the furnace gradually runs down, the rod N contracts and gradually closes the valve in globe H and entirely prevents the admission of water when the heat is below that which is necessary to decompose the steam in space E. Whenever steam forms and its pressure in space E arises to a degree sufficient to drive the water upward and out of pipe D and regulating-valve globe H, a check-valve, of any ordinary form, in globe G will close and hold the steam until it has time to pass out in a decomposed state from holes *a*. The closing of check-valve in globe G also prevents the passage of any water to space E until the steam-pressure is lowered in space E.

Where a supply of steam is convenient, as when this apparatus is applied to a steam-boiler furnace, steam can be run directly into the space E from the boiler and the water-regulating valves be used for admitting the steam-supply.

I claim as my invention—

1. A device for promoting combustion in furnaces, consisting, substantially, of two cylinders A and B, one cylinder placed within the other, the inside cylinder B smaller than the outside cylinder A, leaving a space E between said cylinders, said inside cylinder to have a longitudinal passage-way or cavity to admit the gases of combustion to its central parts, a pipe D, connecting space E with tank F or some other source of water-supply, and small orifices *a* for the egress of superheated steam from space E, the whole placed within a furnace or within a conduit carrying the waste gases of combustion, for the purpose as described.

2. In a means for promoting combustion in furnaces, an automatic water-supply regulator consisting of a tube M, protruding within the furnace-walls C, a rod or pipe N of a material having a greater expansive power by the action of heat than pipe M, said rod or pipe N having its lower end firmly secured to the bottom of pipe M, and rod or pipe N, projecting upward within pipe M, said rod or pipe N having its upper end pivoted to the outer end of lever O, said lever O having its opposite end secured to a rotary valve-stem *i*, the whole arranged to operate for the purpose hereinbefore shown and described.

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