(No Model.)

W. A. KONEMAN.

APPARATUS FOR HEATING WITH FLUID FUEL.

No. 464,695. Patented Dec. 8, 1891.

Fig. 1.

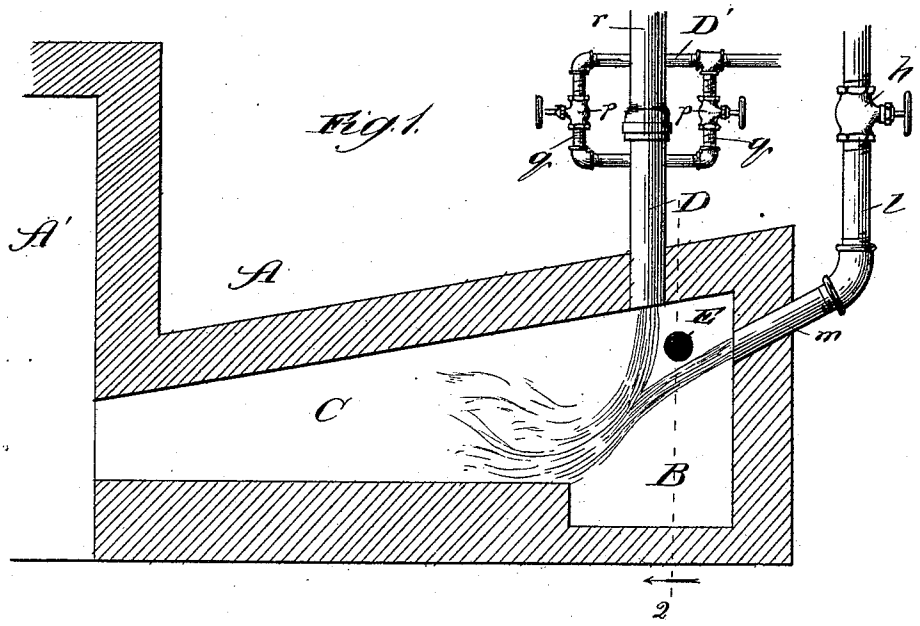


Fig. 2.

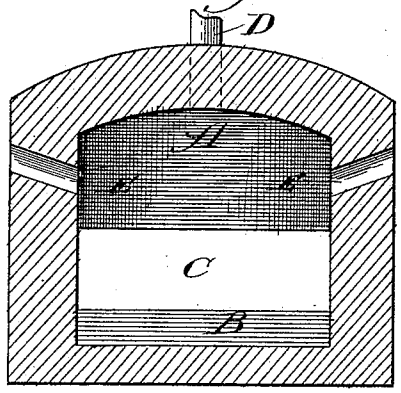


Fig. 4.

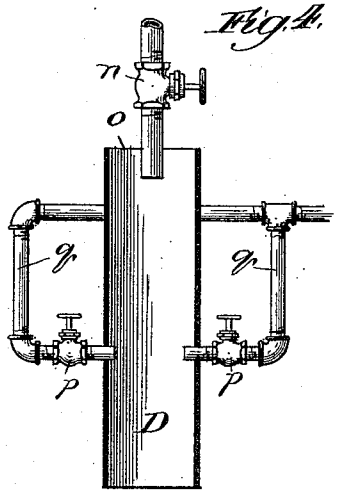
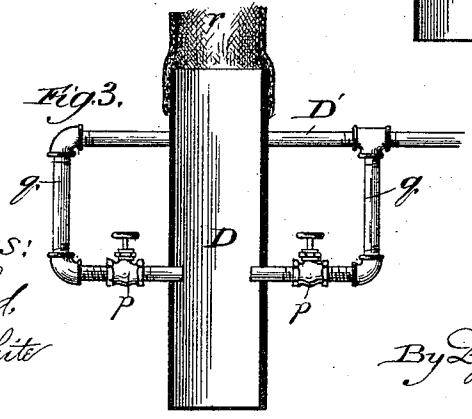


Fig. 3.



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UNITED STATES PATENT OFFICE.

WILLIAM A. KONEMAN, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE CHICAGO HEAT STORAGE COMPANY, OF SAME PLACE.

APPARATUS FOR HEATING WITH FLUID FUEL.

SPECIFICATION forming part of Letters Patent No. 464,695, dated December 8, 1891.

Application filed June 2, 1890. Serial No. 353,996. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM A. KONEMAN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Apparatus for Heating with Fluid Fuel, of which the following is a specification.

The object of my invention is to provide an apparatus for heating objects—such as boilers, drying and annealing furnaces, and the like—with liquid (as hydrocarbon oil) or gaseous fuel, whereby the fuel may be reduced to a condition of complete combustion before its heat is brought into contact with the object to be heated, thereby to enable the direction against such object of or practically of the mere products of combustion in the form of or resembling a blow-pipe flame.

I have employed my invention most extensively with hydrocarbon oil as the fuel, and have caused by my improvement not only a saving of more than one-half the quantity previously used for the same work, but have attained the further advantages incidental to complete combustion of the fuel, such as the avoidance of generating smoke. From the description hereinafter contained, however, and which relates, mainly, to the use of hydrocarbon oil as the fuel employed, it will appear quite obvious that the advantages of my invention are equally attainable with the fuel previously reduced for consumption to the form of gas.

In the accompanying drawings, Figure 1 is a view showing my improved "fore-hearth" or mixing and combustion chamber in longitudinal sectional elevation; Fig. 2, a section taken on the line 2 of Fig. 1 and viewed in the direction of the arrow; Fig. 3, an enlarged sectional view of details of the apparatus, and Fig. 4 a similar view of a modification of the representation in Fig. 3.

A denotes a "fore-hearth," (set forth, also, in my pending applications serially numbered, respectively, 353,995 and 369,193,) so called for want of a better term to express its operative position, in front of a chamber A′, (as the fire-chamber under a boiler, the chamber of an annealing or of a drying furnace, or the like,) in which the effect of the heat is to be exerted. I form the fore-hearth A of a fire-brick shell, preferably of the exterior angular shape illustrated, and which may taper toward the exit end, as shown, and the interior of the shell is formed toward its rear end into a mixing and combustion chamber B, extended as a flue C, preferably, as shown, from the upper side and from above the lower side of the chamber to the end of the fore-hearth, the flue being contracted toward its outlet end, as by tapering it through a vertical plane, which is the construction illustrated, though it may be otherwise contracted to produce the desired result hereinafter described.

D is an induction-pipe leading downward into the chamber B at its upper side and communicating from its outer end, as through a hose connection *r*, with a supply of combustion-inducing fluid, as air or steam, the construction shown in Figs. 1 and 3 being adapted for air, which I supply by connecting the pipe D with a suitable or ordinary air-blower. (Not shown.)

D′ is the oil or gas supply pipe, leading from the source of fuel-supply, as from the oil-reservoir, (not shown,) to the pipe D, with which it communicates through a branch or branches *q*, each being provided with a valve *p* to control the feed of the fuel, and for which purpose I employ the needle-valve variety of valve, the construction of which is well known and need not therefore be herein shown and described in detail. If steam be employed with air, I introduce it into the open pipe D through a nozzle *o*, inserted into the pipe to extend downward therein to a point above the inlet of the branch or branches *q*, and the supply of steam is controlled through the medium of a suitable valve *n*.

In the back of the chamber B is an opening *m*, (or more than one such opening may be provided,) which, like the pipe D, communicates through a pipe *l*, provided with a valve *k*, with an air-blower or a steam-supply. (Not shown.) The opening or openings thus extend in a plane at an angle to that of the pipe D and preferably in a downward-inclined direction, as shown, whereby the inclination will be in line with the rear extremity of the flue C, where it joins the chamber B, at or

about at the offset *i* at the front of the chamber.

E is an opening or port in the wall of the structure, preferably in the side near the top of the chamber B, and extending, by preference, diagonally into the latter, and I provide one such opening in each side.

The operation is as follows: Air (with or without steam) is admitted under pressure through the pipe D into the chamber B, and the oil or gas admitted through a branch *q* on opening to the desired extent a valve *p*. But one of these valves need be used at a time, the main purpose of providing two being to enable the other to afford a reserve for use in case the first should be out of order. The fluid fuel is thus blown downward into the chamber, wherein it is ignited. Then air (or steam, or both) is forced into the chamber through the opening or openings *m*, the current thereof intersecting that from the pipe D and forcing the substance of the latter downward in the chamber, thereby thoroughly intermixing, initially, the substances of the two intersecting streams. When combustion has progressed sufficiently far, the valve *p* is opened to admit as much of the liquid fuel as the apparatus will consume completely, or approximately so. The tendency of the flow of the burning fuel, and which is given additional impetus by the force of the current emitted from the opening or openings *m*, is toward the outlet end of the flue C, and that of the formed and unconsumed hydrocarbon gas or light vapor is to occupy the upper strata of the current, and thus tend in an upward direction within the latter, owing to the lighter specific gravity of such vapor than that of the air, which will tend to occupy a lower stratum. The contraction of the flue in a vertical direction toward its outlet end tends, however, to retard and further intermix the unconsumed elements of the fuel and air, whereby combustion is forced and the escape and loss of unmixed and hence unconsumed fuel becomes an impossibility so long as sufficient air is supplied, so that when it reaches the mouth of the flue its consumption is complete, or approximately so.

A very important feature of my improvement is the port or ports E in the fore-hearth, by means of which, being permanently open and out of the range of the injector action of the fuel-supply, whereby such action does not draw in air through the ports, the amount of fuel which may be consumed by the amount of air injected may be accurately and readily regulated to accomplish perfect or approximately perfect combustion. The moment the feed of fuel is greater than the fore-hearth can dispose of (in the sense of effecting its complete combustion) the fact is manifested by the emission from the port or ports E of the non-consumed fuel in the form of smoke and gas. Thus the port serves as a reliable monitor of the condition of combustion inside the fore-hearth, and enables waste of fuel to be avoided by indicating the necessity, as soon as it occurs, for regulating the supply.

As will be noticed, the fore-hearth serves merely the purpose of producing products of combustion by reducing the fuel to such condition, and when so reduced they are utilized for imparting their heat to the object to be heated, whereby practically no valuable portion of the fuel is wasted.

What I claim as new, and desire to secure by Letters Patent, is—

1. In combination, a chamber A′ and a fore-hearth A, comprising a chamber B, into which the fuel-supply with air or steam is injected, and provided with one or more ports E out of the range of the injector action of the fuel-supply, and an intermixing-flue C, connecting the two chambers and contracted toward the chamber A′, substantially as described.

2. In combination, a chamber A′ and a fore-hearth A, comprising a chamber B, having an intermixing-flue C, contracted toward its outlet end, at which it is connected with the chamber A′, air or steam and fluid-fuel supply pipes leading into the chamber B and directing the fuel-supply toward the outlet end of the flue C, and one or more ports E in the fore-hearth out of the range of the injector action of the fuel-supply, substantially as described.

WILLIAM A. KONEMAN.

In presence of—
J. W. DYRENFORTH,
M. J. FROST.