A. T. JONES.

METHOD AND APPARATUS FOR BURNING FUEL OIL.

APPLICATION FILED JULY 20, 1906.

1,039,752. Patented Oct. 1, 1912.

Fig. 3.

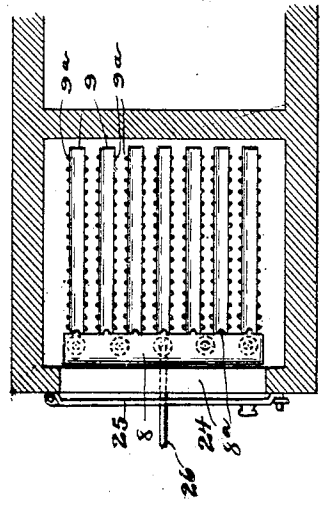


Fig. 1.

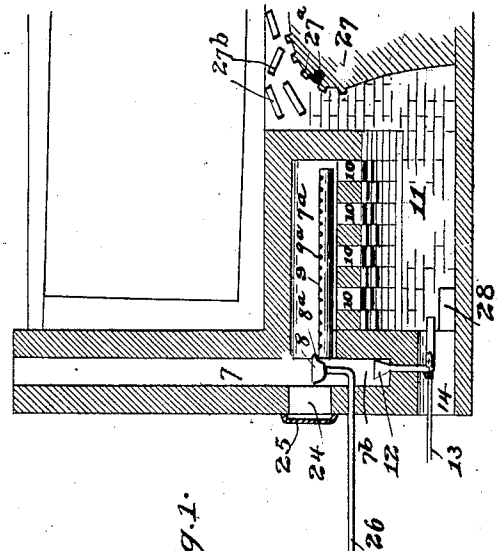


Fig. 2.

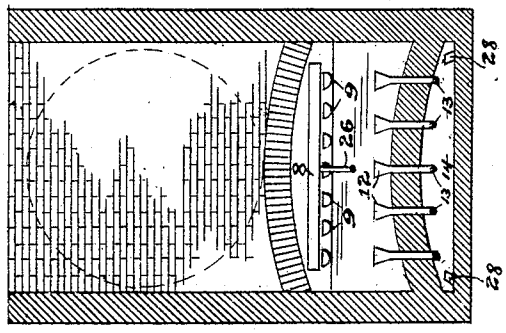
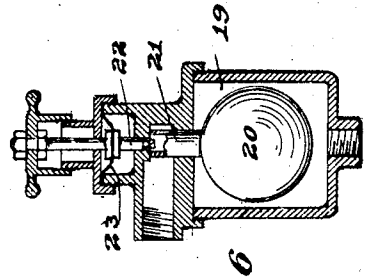


Fig. 4.



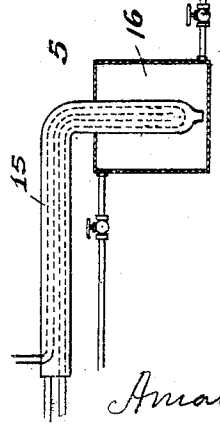
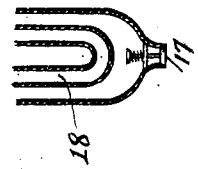


Fig. 1a.



Witnesses,
Walter M. Fuller

Inventor,
Amanda T. Jones
By Offield, Towle & Linthicum
Attys

UNITED STATES PATENT OFFICE.

AMANDA T. JONES, OF JUNCTION CITY, KANSAS.

METHOD AND APPARATUS FOR BURNING FUEL-OIL.

1,039,752. Specification of Letters Patent. Patented Oct. 1, 1912.

Application filed July 20, 1906. Serial No. 327,039.

To all whom it may concern:

Be it known that I, AMANDA T. JONES, residing at Junction City, Geary county, Kansas, have invented certain new and useful Improvements in Methods and Apparatus for Burning Fuel-Oil, of which the following is a specification.

The common and almost universally-accepted method of using oil as a fuel for furnaces is to deliver the oil through burners constructed to operate upon the injector principle, the object sought being to deliver the oil into the combustion chamber in a finely divided condition, it being supposed that thereby its combustion is greatly promoted. As a result of long study and much experimentation, I have discovered that the use of atomizers, injectors or burners of the types commonly employed may be dispensed with and that with the aid of simple appliances a more complete combustion of the oil may be secured, resulting in a greater economy of fuel, proportional to the heat developed, than is obtained by present methods.

To this end, my improvements comprise: First: the feeding of liquid fuel, whether of high or low gravity, at such a temperature as to insure liquidity without unnecessary release of gases previous to ignition, directly into the combustion chamber without the intervention of injectors or so-called atomizers and without the aid of steam, air or gases for breaking up or atomizing the oil in preparation for burning. Second: the maintaining, by automatic means, of a corresponding fluid level or equilibrium between connected receptacles (single or in duplication) for the liquid fuel on its way from the main tank to the place of escape, the primary receptacle being set outside of the furnace casing but proximate thereto and the secondary or feeding receptacle or receptacles being located within a chamber above the fire box but protected from direct contact with the flames. Third: the use of devices for increasing fuel supply by fine gradations, whenever the demands of the furnace and the necessities of work are greater than can be met by the pre-arranged fluid-level used for safe handling on first firing. Fourth: feeding the oil in globules by allowing it to overflow from the feeding receptacles through apertures in a checker-work, constituting a screen against the flames, directly into the furnace, and maintaining the supply preferably along the breadth of the fire-box. Fifth: the supply of air to the flames within the fire-box by natural draft through an extended opening, preferably as long as the breadth of the furnace will allow but no wider than is essential to the freest possible combustion of the hydro-carbons generated therein by the accumulative heat, the basal line of said aperture or opening being preferably coincident with the level of the floor within. Sixth: the employment in some instances of a forced draft to supplement the natural draft by the introduction along the said draft opening, somewhat above the level of the floor thereof, of twyers or blast pipes. Seventh: the provision of a bridge wall of such conformation as to cause the flame to revolve upon itself or reverberate within the fire chamber, whereby more complete combustion and consequently less smoke is produced. Eighth: the use of baffles of fire-bricks set slantwise, at each corner of the draft opening, toward the side walls of the fire-box, which by excluding air from the little spaces behind them, create what may be described as vacuum pockets into which the flames are drawn that would otherwise whip out of the fire-box under blast. Ninth: the employment of similar vacuum pockets or heat traps along the boiler floor, or near the arch of escape, and the construction of that arch in such a manner as to cause the utmost possible reverberation of flame or flame-products, before the pull of the smoke-stack shall be allowed its way with the residue—that pull, while inevitably exercising an agitating influence tending to insure complete combustion, having been restrained by the above mentioned pockets or traps and the reverberatory effect of curved arches, from snatching away the heat-products until they have become relatively exhausted. In this manner I govern and direct the fire so created, its combustion being so controlled as to extract and utilize the heat energy for the production of steam, treatment of ores or for any other purpose to which it may be applied.

The apparatus which I have designed to aid in carrying out my improved process is novel as to the structure of its several parts

and in their combination and coöperation to effect the ends desired. This apparatus includes:

(*a*) Means for preliminarily treating the oil by means of compressed air of a desired temperature, such body of warmed air under pressure being liberated within the body of oil so as to maintain it at the desired degree of liquidity; and the oil being conducted to the furnace through passages closed to the external atmosphere retains not only its liquid condition but carries with it a body of air which promotes its combustion when delivered into the furnace; also it will be found free of those clogging, viscous clots certain to be formed when steam-pipes are used for heating purposes as seems to be invariably the case.

(*b*) Means for controlling the quantity of oil supplied to the furnace. This means comprises an automatic but controllable feed-regulator comprising a chamber to which the oil is fed, with suitable inlet and outlet passages and a float contained within the chamber, said float operating in conjunction with a movable valve or safety gate, controlling the supply of oil proportionally to the demands of combustion.

(*c*) Means for supplying oil to the flame. These said means comprise a system of open distributing conduits and preferably a primary supply conduit into which the oil is delivered and from which it overflows into a series of secondary conduits or distributing troughs located immediately over the combustion chamber and supplying oil by overflow in thin streams or sheets, or drops which descend through suitable checkerwork into the mass of flame beneath.

(*d*) A draft-flue which is shown as having an open top is located in the front wall of the furnace, interposing a heat protecting and sound-deadening or blast-deadening space between the fire and the operator. This flue has a breadth fully or nearly equal to that of the fire-box, and a depth of but a few inches except at one place where it opens into a chamber or *cul-de-sac* meant for the reception of the oil-distributing conduits or troughs said flue being provided with an outward-opening door, which will at any time permit the operator to look within, or at need withdraw and replace the conduits should they require a little cleansing, without materially delaying the work of the furnace. Below this *cul-de-sac* the flue returns to its narrow depth, which is sufficiently wide to accommodate a series of pipes opening at their upper ends into the flue and communicating at their lower ends with steam pipes by means of which air is drawn through the pipes from the flue and delivered to the combustion chamber.

(*e*) The provision of an always-open draft aperture in the furnace front and leading into the lower part of the combustion chamber.

(*f*) The novel construction of the bridge wall, baffles and heat pockets, above mentioned.

In the accompanying drawings I have shown a typical arrangement of a steam boiler furnace with my oil supplying device applied thereto and have illustrated the details of construction of some of the parts which are of novel construction.

In said drawing Figure 1 is a diagrammatic view partly in section; and Fig. 1ª a detail view of the oil heating device; Fig. 2 is a transverse section through the boiler front, showing the oil distributing conduits and twyers in elevation; Fig. 3 is a sectional plan view taken above the combustion chamber and oil distributing conduits; and Fig. 4 is a sectional elevation of the oil supplying device or safety gate.

In the accompanying drawings, 5, represents the oil heating means; 6, the feed regulator; 7, the flue formed within the furnace front; 8 and 9 the oil distributing vessels; 10, the checker work through which the oil is delivered into the combustion chamber 11.

12 represents the twyers for supplying air to the combustion chamber; 13, small steam pipes and 14 the natural draft opening.

The oil heating means.—Said means comprise in preferred construction a suitable heat conveying pipe, 15, which may be of elbow form, its lower leg entering the oil heating chamber, 16, this pipe being adapted to convey air to the chamber 16 and contain means for heating the air. The terminal portion of the elbow is provided with an opening controlled by normally closed valve, 17, which prevents the ingress of oil to the air conveying pipe when the apparatus is not in use. Arranged within the air conveying pipe which may receive its supply of air from any suitable source of air under pressure, is a steam pipe, 18, fed from any convenient supply, the steam pipe being extended into the bent leg of the air pipe by preference and the air being preferably supplied under pressure to the air heating chamber so as to unseat the valve, 17, and cause the air to be discharged into the body of oil contained within the chamber, 16, near the bottom of said chamber, the air rising within the body of oil and imparting to the latter its heat until the oil is sufficiently warm to flow but never to the point of eliminating the desirable gases contained within the oil itself. A small vent opening may be provided in the top of the heating chamber 16, if preferred, to permit the escape of excess air therefrom. From the oil heating chamber, 16, the oil flows through the valved pipe to the feed regulator, 6, the internal construction of which is illustrated in Fig.

4. Said regulator comprises a float chamber, 19, containing the float, 20, and a hollow cut-off valve, 21, which rests on top of the float and slides within the passage leading into the float chamber. This cut-off may be manually controlled by means of the valve stem, 22, and the valve stem is preferably provided with the flexible diaphragm, 23, thus sealing the passage against the escape of gases and rendering the device safe in use. The safety device is preferably located near the furnace front, which is provided with an opening, 24, leading into the flue 7, and normally closed by the door, 25. Below this opening the supply pipe, 26, passes and delivers into the oil supply conduit or header, 8, located within the flue which has a lateral extension or *cul-de-sac*, 7ª. Within this latter is located a series of distributing conduits, 9, which are preferably arranged transversely to the header, 8, and with their ends projecting beneath the same which is provided with suitable overflow notches as indicated at 8ª, and the series of distributing conduits, 9, are also provided at their lateral margins with notches, 9ª. Below the series of distributing conduits, 9, there is provided checkerwork, 10, through which checkerwork the drops, globules, or thin streams of oil trickle directly into the combustion chamber, 11. The twyers, 12, lead from the lower portion 7ᵇ, of the flue, 7, and deliver into the combustion chamber at a suitable elevation above its floor, well in front of the flame. The bridge wall, 27, is of suitable form to cause the reverberation of the flame within the combustion chamber and this effect may be increased by the provision of projecting ribs, 27ª, formed of fire brick, set into the surface of the bridge wall. The throat of the furnace is obstructed by the heat traps 27ᵇ, which may be composed of brick and are arranged out of alinement with each other, with their major axes extending in the general direction of the length of said throat. 28 represent similar traps set on the floor of the combustion chamber near the draft opening.

Briefly described, the operation is as follows: The oil is supplied to the preliminary heating chamber, 16, and heated air is forced therethrough thus aerating and warming the oil which is permitted to flow by gravity through the feed regulator, the supply being automatically controlled by the float on firing and afterward manually controlled by the valve. From the regulator the oil flows into the bottom of the header or main distributing conduit, 8, and filling the same overflows into the series of distributing troughs or vessels, 9, and being further subdivided therein and by its passage through the checkerwork below, is delivered into the combustion chamber. Ignition may be effected by means of a torch thrust into the combustion chamber and combustion is supported by the air drawn into the chamber through the natural draft opening, 14. When combustion is once fairly established, the partial vacuum created within the combustion chamber by the draft of the stack suffices to draw in the needed quantity of air through the natural draft opening and the twyers and also to take up and completely consume the oil supplied through the heating chamber and feed regulator. The flame impinging against the forward surface of the bridge wall, which is preferably forwardly extended, as shown, is caused to reverberate within the combustion chamber and the products of combustion on their passage to the stack are further deflected and commingled so as to extract the heat therefrom. The supply of air being drawn in through the opening for natural draft and further enhanced by the twyers leading from the flue, will at all times be adequate to the maintenance of combustion and the supply of oil is effected not alone by gravity, although this force is dependable, but also by reason of the vacuum resulting from the draft which aids in the supplying of the oil. In operation, the warmed oil flows through the feed regulator on to the header and begins to drip into the secondary conduits or distributers. Meanwhile the cut-off valve of the feed regulator begins to close under the action of the float. After the oil begins to drip and ignition is effected, the oil will be supplied in proportion to the rate of combustion, the regulator automatically controlling the supply.

I claim:

1. The herein described method of burning fuel oil in furnaces, which consists in first aerating the oil, conducting the aerated oil to a space above the combustion chamber, dividing the oil into a multiplicity of drops or globules throughout an area substantially equal to that of the combustion chamber and permitting said drops or globules to drip into the combustion chamber, and introducing a current of air over an approximately equal area in the lower portion of the combustion chamber, substantially as described.

2. The herein described method of burning fuel oil which consists in first aerating the oil, feeding the aerated oil in the form of drops or globules, by gravity, into the upper portion of the combustion chamber, inducing a current of air to support combustion into the lower portion of the combustion chamber, and supplementing the induced draft by means of forced draft delivered into the combustion chamber adjacent to the front of the furnace, substantially as described.

3. An oil-burning furnace, having an open top flue arranged in the furnace front,

said flue having a chamber or pocket communicating therewith and extending laterally over the combustion space of the furnace, and means for supplying oil to said chamber or pocket, substantially as described.

4. In an oil-burning furnace, an open top flue located in the furnace front and having a lateral chamber or *cul-de-sac* extending over the combustion space, an oil-distributer located in said chamber, a perforated partition between the combustion chamber and said distributer, and means for introducing oil to said distributer, substantially as described.

5. In an oil burning furnace a flue arranged in the front wall of said furnace and having a lateral chamber extending over the combustion space, and a lower leg below said lateral chamber, a series of open top distributers or conduits arranged within said chamber, a supply conduit or header arranged within the flue, means for introducing oil into said header, a series of twyers communicating with the lower extension of the flue and with the combustion space, substantially as described.

6. In an oil burning furnace a flue arranged in the front wall of said furnace and having a lateral chamber extending over the combustion space, and a lower leg below said lateral chamber, a series of open top distributers or conduits arranged within said chamber, a supply conduit or header arranged within the flue, means for introducing oil into said header, a series of twyers communicating with the lower extension of the flue and with the combustion space, and means for creating a forced draft through said twyers.

7. In an oil burning furnace, a combustion chamber, an open top flue arranged in the front wall of the chamber and having a lateral extension over the combustion chamber, means for supplying hydrocarbon fuel to said lateral extension and an air supply opening in the lower portion of the front wall of the furnace substantially equal to the width of the combustion chamber.

8. In an oil burning furnace, a combustion chamber, means for supplying oil by gravity into the upper portion of said chamber, an air supply opening leading into the lower portion of said chamber, a forwardly curved fire arch or bridge wall, and a series of baffles arranged above the bridge wall and within the passage for the products of combustion, substantially as and for the purpose described.

In witness whereof I have hereunto set my hand, this 14th day of July, 1906.

AMANDA T. JONES.

Witnesses:
CHAS. H. MANLEY,
MARION I. MANLEY.