J. DARLING.

LIQUID FUEL BURNER.

APPLICATION FILED DEC. 30, 1908.

933,829. Patented Sept. 14, 1909.

Fig. 1.

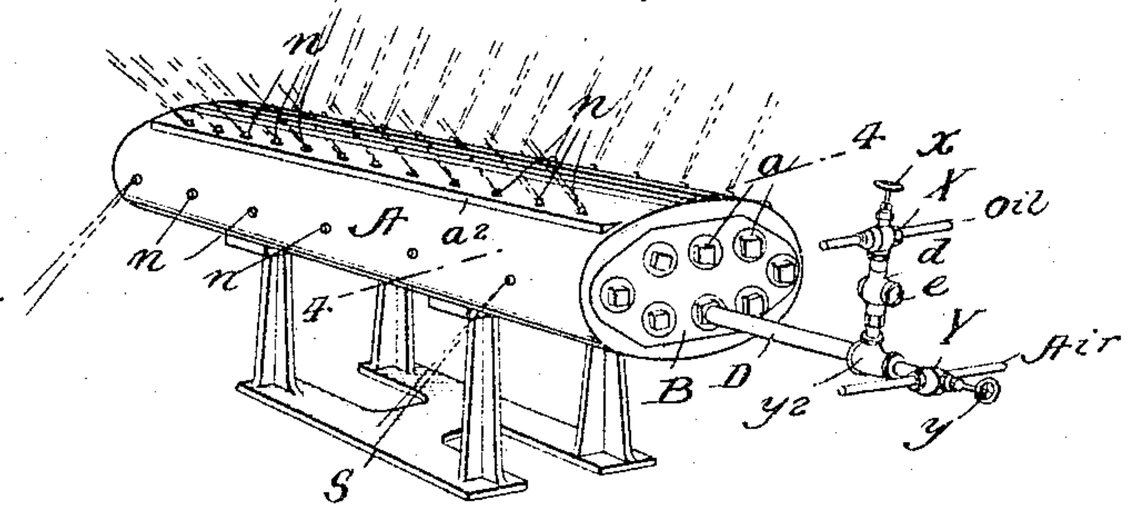


Fig. 2.

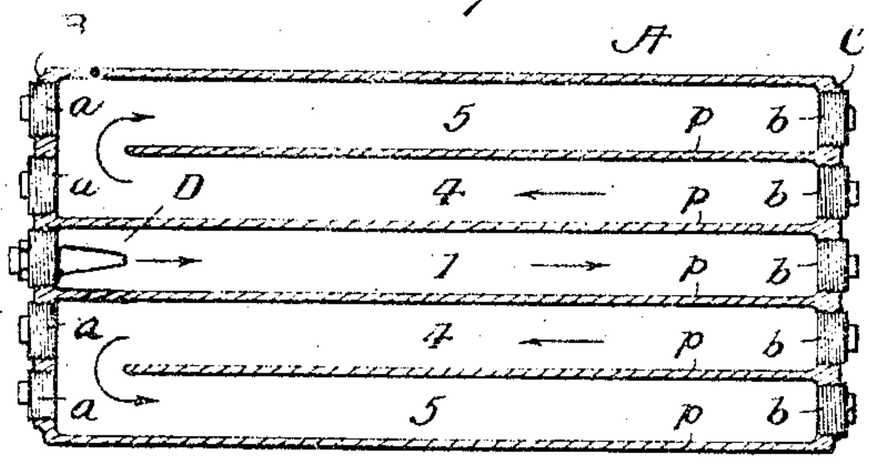


Fig. 3.

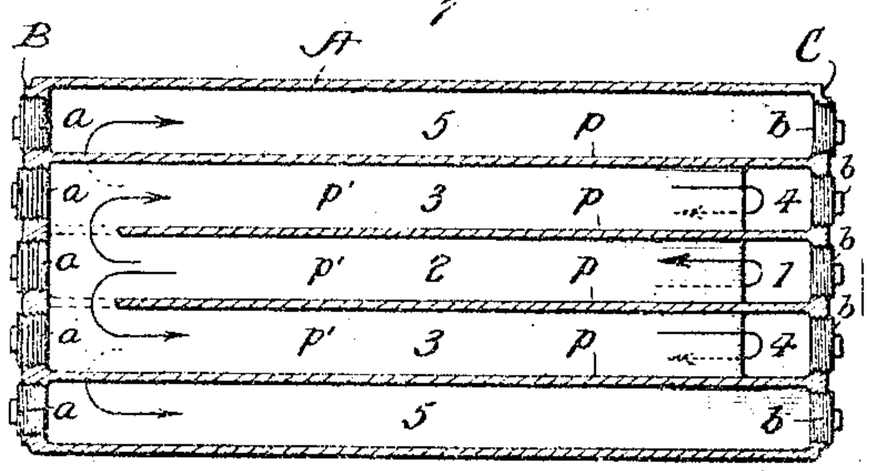


Fig. 6.

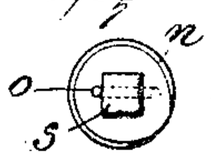


Fig. 4.

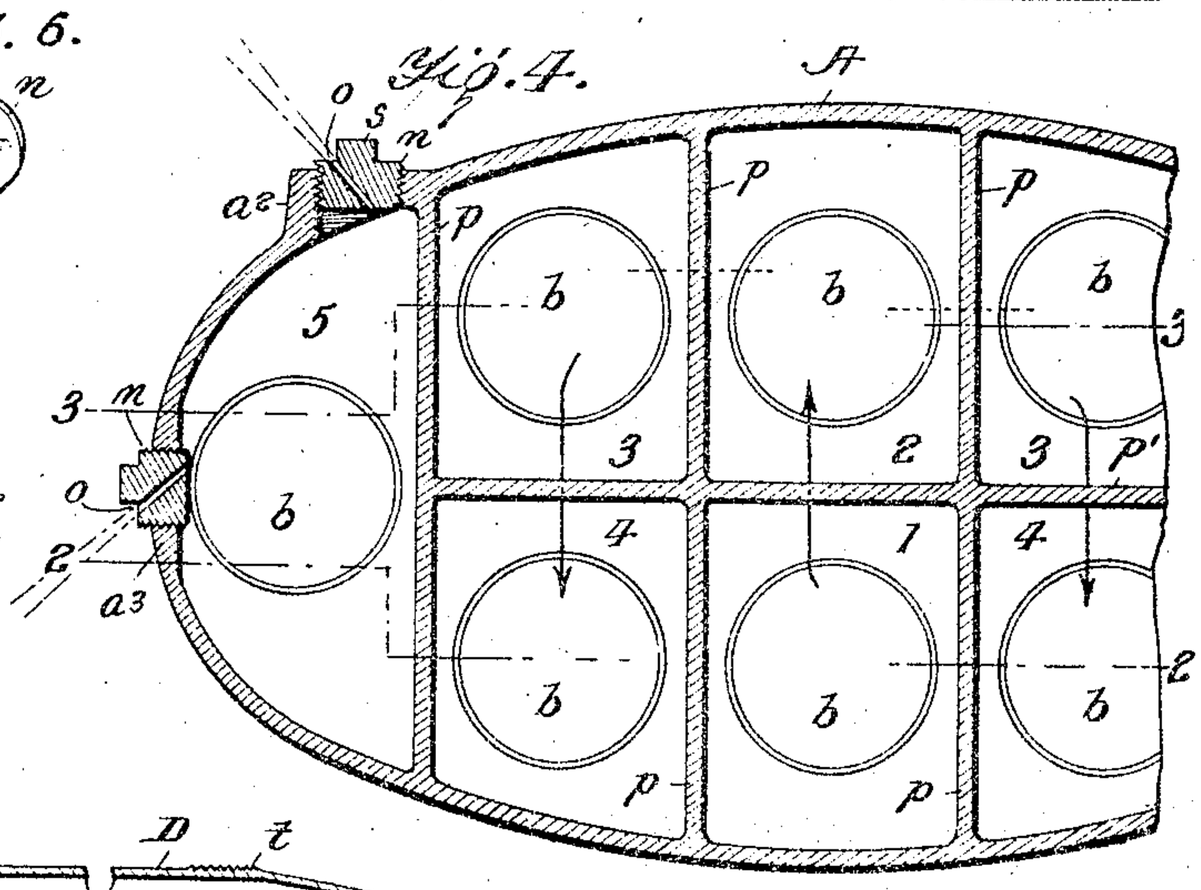
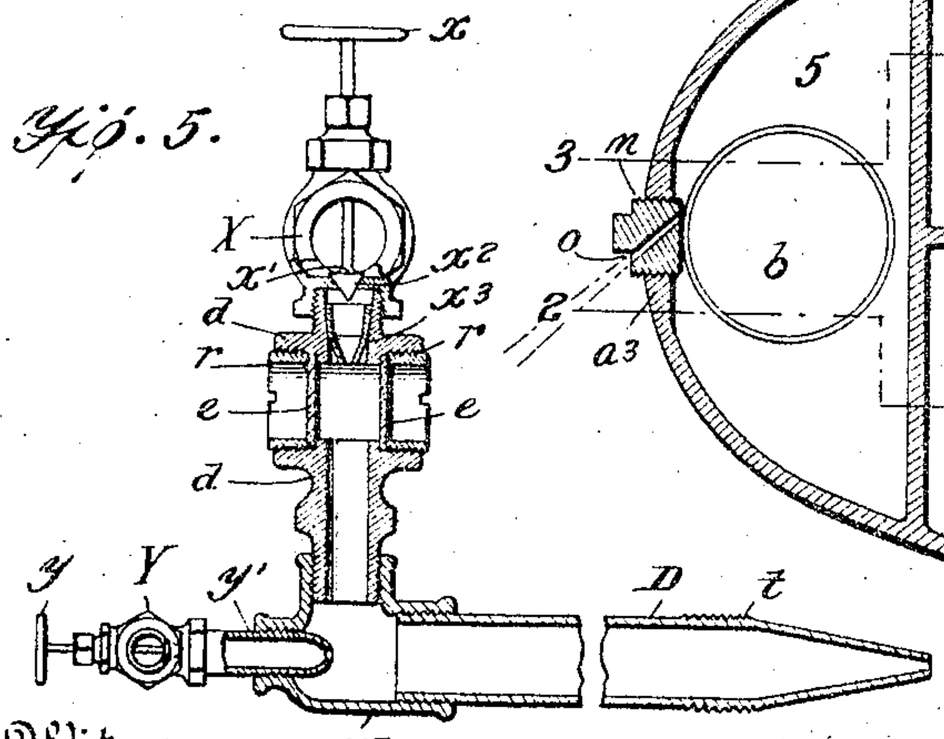


Fig. 5.



Witnesses

L. H. Schmidt.

C. W. Byrn Jr.

Fig. 7.

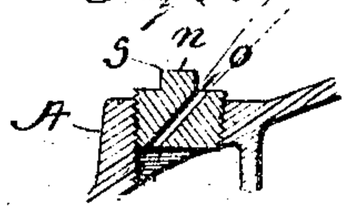
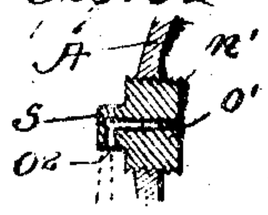


Fig. 8.



Inventor

JOSEPH DARLING,

By Edw. W. Byrn.

Attorney

UNITED STATES PATENT OFFICE.

JOSEPH DARLING, OF CHICORA, PENNSYLVANIA, ASSIGNOR TO THE SMOKELESS HEAT & POWER COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

LIQUID-FUEL BURNER.

933,829. Specification of Letters Patent. Patented Sept. 14, 1909.

Application filed December 30, 1908. Serial No. 69,932.

To all whom it may concern:

Be it known that I, JOSEPH DARLING, a citizen of the United States, residing at Chicora, in the county of Butler and State of Pennsylvania, have invented certain new and useful Improvements in Liquid-Fuel Burners, of which the following is a specification.

My invention relates to liquid fuel burners designed to burn crude petroleum, or other similar hydrocarbon, and to be used for heating retorts in gas making, or for raising steam, or for any other purpose for which it may be desired.

It is an improvement in burners of that form which employ air under pressure to inject the oil into a cellular burner of retort form, and it consists in the novel construction and arrangement of the burner and its accessories, as will be hereinafter more fully described with reference to the drawing in which,

Figure 1. is a perspective view of the burner complete. Fig. 2. is a horizontal section taken on line 2—2 of Fig. 4. Fig. 3 is a horizontal section taken on line 3—3 of Fig. 4. Fig. 4. is an enlarged vertical transverse section taken on line 4—4 of Fig. 1. Fig. 5. is an enlarged vertical section of the spray nozzle and its feeding device and, Figs. 6, 7, and 8 are details of the flame nozzles.

In the drawing A represents the elongated body of the burner which in cross section is of elliptical or oval shape and of a size and length adapted to the uses to which it is to be put. It is cast in one piece with its two ends or heads B and C, to form an integral structure. The heads in the middle portion are slightly raised or thickened, as seen in Fig. 1, to give proper depth of seat to the screw plugs *a* and *b*, and on each side of the middle line of the burner between the major and minor axes of the ellipse is also formed a thickened ledge a^2 to give proper seating space to the parallel rows of flame jet nozzles *n* which are screwed into holes in said thickened parts. There are two parallel rows of nozzles arranged in the upper surface of the casing to direct the flames upward, and two others which are arranged at the sides in the thickened walls a^3 direct the flames downwardly and outwardly.

In casting the burner casing it is made with a plurality of longitudinally arranged and parallel channels through which the mixture of oil and air is made to travel in a tortuous course, so as to be completely gasified before emerging through the jet nozzles *n*. These channels are formed by partitions *p*, p^1 cast integrally with the outer casing. These channels are eight in number, three upper ones extending from the top to the middle line, three lower ones extending from the bottom to the middle line and one on each side at the extremity of the major axis of the ellipse as seen in Fig. 4. In casting these channels there are openings left in the heads B and C, at both ends, which openings are arranged coaxially with the longitudinal axis of each channel and which openings are afterward screw threaded and closed by screw plugs, *a a* and *b b*. These openings are important for permitting of the support of the cores used in casting the device, and also for permitting the cleaning out of the channels of any deposited carbon and other residuum after the burner is put in service. The screw plugs have square wrench lugs so that they may be conveniently removed when necessary.

In casting the burner body the two outer vertical partitions of the lower part of the burner stop short of the front head B of the burner, as seen in Fig. 2., and the two inner vertical partitions of the upper part of the burner also stop short of the front head B, as seen in Fig. 3. The horizontal partition p^1, in like manner stops short of the back end C of the burner as also seen in Fig. 3. This causes the oil and air, which enters through pipe D Fig. 2. to traverse the following course. From pipe D Fig. 2. into lower middle channel 1 to the back end of the retort; thence up around the horizontal partition to channel 2 above, see Fig. 3., and through it to the front end; thence, dividing, passes equally into the upper side channels 3 3, as indicated by the arrows; through these channels 3 it passes to the back and dipping down into the subjacent channels 4 4; thence, see Fig. 2. to the front again and around the vertical partitions into the two outer side channels 5, where, see Fig. 4., the gas, after being thoroughly formed and heated by prolonged travel, issues through the jet nozzles *n* into the fire chamber or space to be heated. This prolonged travel is made to take place within compact limits

and the exterior shape of the burner and its internal partitions are such that expanding and contracting strains are so distributed that there is no tendency to crack the casting, since the ellipse in contracting and expanding accommodates itself perfectly to the expansion and contraction of the partitions within, thus forming a very durable burner and enabling it to withstand the trying temperature strains of the interior of any fire box.

The jet nozzles *n* form a very simple and practical feature of my invention which gives it a very wide range of use for securing either a concentrated heat, or a diffused heat, according to the use made of the burner. That is to say, the jet nozzles *n*, Figs. 4, 6, 7, and 8, consist of screw plugs which have square lugs *s* adapted to receive a wrench for turning them. Through each plug is drilled a straight passageway *o* which is at an angle to the longitudinal axis of the plug and enters the plug in the corner formed by the lug *s* and the outer face of the plug. This corner holds the drill to place in starting the same so that the inclined passageways can be drilled through the same, but this construction also secures the important result that by a wrench applied to the lug *s*, the plug can be rotated so as to turn the jet orifice *o* in any direction. As seen in Fig. 4., the jet orifice at the top is turned to the left, and this would be the position for a diffused heat thrown outwardly from the burner as for heating a bench of gas retorts, a steam boiler, etc., but, as will be seen in Fig. 7. the direction of the jet may be reversed by turning the plug by a wrench, and all the nozzles may be so turned as to direct the flames to a concentrated zone of heating, such for instance as the glory hole of a glass furnace. I prefer to make the jet orifice as seen in Figs. 4 and 7, as the drill is easily held to its work and makes a straight hole which may, if clogged, be easily cleaned out by a straight piece of wire, but I may make the jet orifice as in Fig. 8., with two drillings at an angle to each other, it being essential only that the issue orifice should be at an angle to the longitudinal axis of the plug and at one side of the same and that the plug should have a wrench lug for giving it rotary adjustment. Another advantage of this form of jet nozzle is its longevity against burning out, as it is completely embedded in the metal of the casing and is not affected by the heat as a protruding nozzle or tube would be. Oil and air are supplied to the burner from two parallel horizontal pipes seen in Fig. 1, which extend past the end of the burner and to and past any number of such burners.

As before stated the oil and air are introduced under pressure into the lower middle channel 1 through the feed tube D. This is made with an external screw thread *t*, Fig. 5., which is screwed into a bushing in the head B as seen in Fig. 2. The outer end of the tube D is screwed into a T-fitting y^2 Fig. 5., into the horizontal nipple of which is screwed the air nozzle y^1 taking air from the fitting Y which is placed in a length of pipe as seen in Fig. 1. and which pipe may extend past and supply any number of burners. The valve *y* Fig. 5. has its seat between the fitting Y and the nozzle y^1 so that any burner can be cut off from the air pipe without interfering with the free passage of air past that burner to others in the series. In the upper nipple of the T-fitting y^2 is screwed the upright tubular frame *d* of special form which receives oil from the oil pipe Fig. 1., through the valve $x\ x^1$, the seat of which is at the bottom of the fitting X placed in the length of oil pipe so that the cutting off of oil from any burner does not interfere with the free passage of oil past that burner to others in the series. The fitting X is screwed onto the top of tubular frame *d* and within the latter is a tapered bushing x^3 which causes the oil in descending to pass down in a centralized stream. To make the passage of the oil visible for adjustment purposes, I provide in the tubular frame *d* a special form of sight feed constructed as follows. On opposite sides of the tubular frame *d* are formed circular flanged openings screw threaded interiorly and having circular glass plates *e e* clamped into the same by means of externally screw threaded clamp rings *r r* which are provided with nicks or notches to receive a tool by which they may be turned. By means of these rings the glass plates are clamped in place on opposite sides of the tubular frame *d* so as to form windows through which the passage of oil in a stream from the tapering bushing x^3 may be observed, thus enabling the action of the burner to be regulated by actual observation from the exterior of the fire chamber.

The burner as thus described, may be maintained in any desirable position by any desirable means, but for most purposes I prefer to employ a stand S as seen in Fig. 1. which sustains it in proper position in the average fire chamber, and allows a proper space beneath it for a starting fire and for the circulation of the products of combustion beneath it.

I claim,

1. A liquid fuel burner, comprising an outer casing of elliptical unitary form in cross section having jet orifices, and constructed with heads and parallel partitions within to form parallel channels opening into each other for continuous passage, the said partitions and heads being formed in one piece with the outer casing as an integral structure, and both heads being formed

with openings and detachable screw plugs at the opposite ends of each channel.

2. A liquid fuel burner, comprising an outer casing of elliptical form in cross section having two parallel thickened ledges between the major and minor axes, rows of jet nozzles arranged in these ledges and parallel channelways within the casing between the rows of nozzles.

3. A liquid fuel burner, comprising an outer casing of elliptical form in cross section having two parallel thickened ledges between the major and minor axes, rows of jet nozzles arranged in these ledges, and parallel channelways within the casing between the rows of nozzles, there being a double tier of communicating channelways between the ledges, and a single channelway at the extremity of the major axis of the ellipse opening directly to the jet nozzles.

4. The combination of a burner casing having jet nozzles, separate parallel air and oil pipes extending across the end of the burner, an induction pipe entering the burner, an air nozzle opening into the induction pipe, an air valve between the air pipe and air nozzle, a vertical tubular frame arranged between the oil pipe and air induction nozzle and having a glazed window in the side to form a sight feed for oil.

5. The combination with a burner casing, of a jet nozzle formed as a solid screw plug having an angular turning lug on its outer end and having an issue orifice located on one side of said turning lug and opening externally in a direction at an angle to the longitudinal axis of the plug and extending through the solid plug to its inner end.

6. The combination with a burner casing, of a jet nozzle formed as a screw plug having an angular turning lug on its outer end and having an issue orifice located on one side of said turning lug and opening externally in a direction at an angle to the longitudinal axis of the plug, said issue orifice being located at the corner between the turning lug and the outer face of the plug and being extended straight through the plug in an inclined position.

7. A liquid fuel burner, comprising an outer casing elliptical in cross section and provided internally with a communicating series of parallel passageways, the passageways on each side at the extremity of the major axis of the ellipse being the last of the series and provided with a plurality of jet nozzles.

8. A liquid fuel burner, comprising an outer casing elliptical in cross section and provided internally with a communicating series of parallel passageways, the passageways on each side at the extremity of the major axis of the ellipse being the last of the series and provided with a plurality of jet nozzles made rotarily adjustable and having eccentric issue orifices.

In testimony whereof I affix my signature in presence of two witnesses.

JOSEPH DARLING.

Witnesses:
E. W. Byrn, Jr.,
C. M. Forrest.