

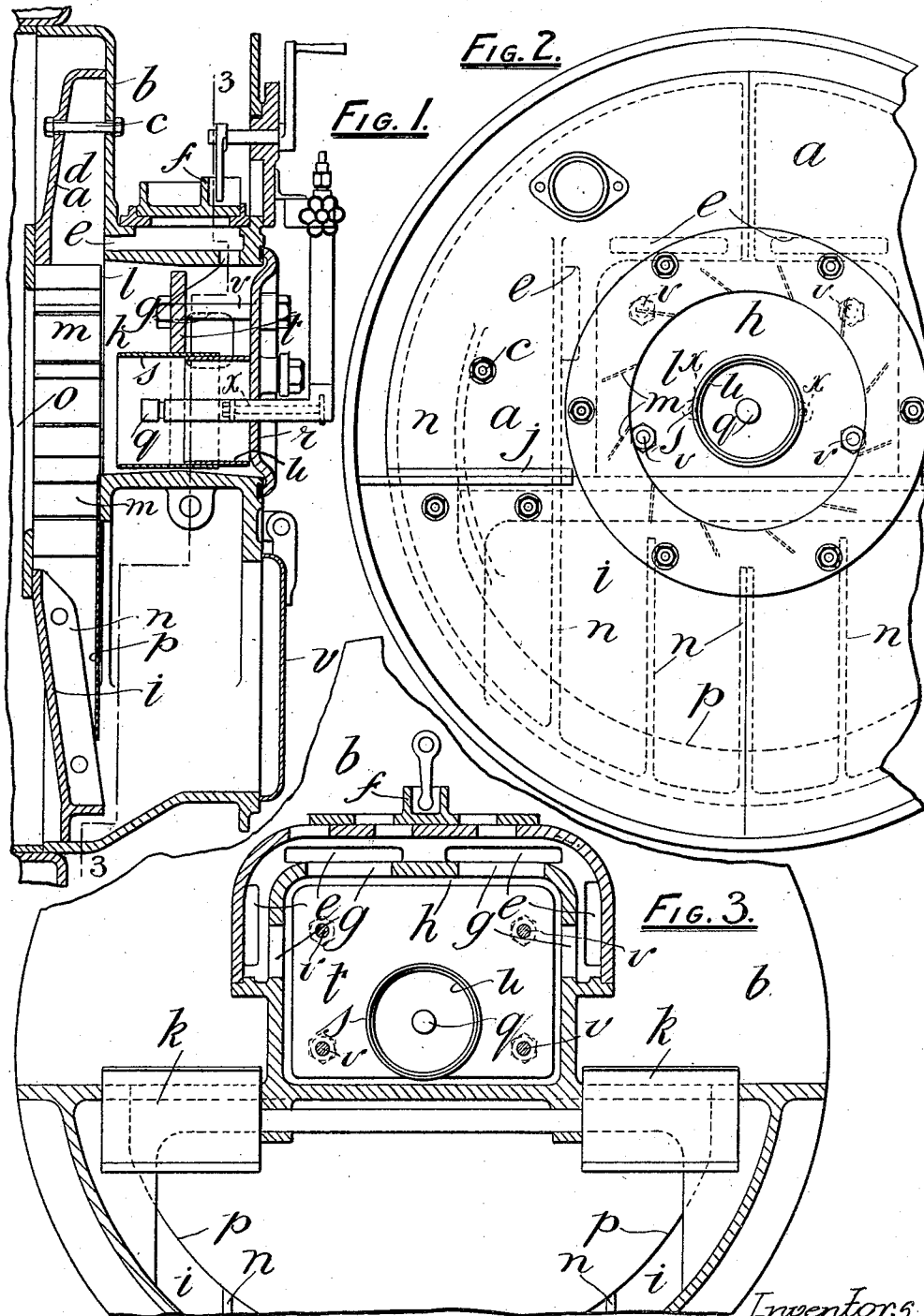
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J. G. McKEAN ET AL

LIQUID FUEL FURNACE

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UNITED STATES PATENT OFFICE.

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LIQUID-FUEL FURNACE.

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To all whom it may concern:

Be it known that we, JOHN GRAVES McKEAN and ROBERT FREDERICK JONES, engineers, subjects of the King of Great Britain and Ireland and the Isle of Man, residing, respectively, at Westerhill, Mount Vernon, Lanarkshire, Scotland, and 11 Leven Street, Pollokshields, Glasgow, Scotland, have invented new and useful Improvements in Liquid-Fuel Furnaces, of which the following is a specification.

This invention has reference to improvements in and relating to liquid fuel furnaces of the type described in the specification of our prior British Patent No. 154,124, dated the 9th April, 1920.

In the specification of said prior patent means are described whereby furnace fronts of the Howden forced draft type may be adapted for burning either coal or liquid fuel; the arrangement being such as will meet the case when the desire to change over from one fuel to the other may be comparatively frequent.

This invention comprises an arrangement whereby the said furnace fronts are adapted for liquid fuel burning where the desire to change back to coal burning may be comparatively rare.

In the specification of our said prior patent covering plates are attached to and at a suitable distance behind the baffle plates or air boxes so that above the dead plate and between said covering plates and air boxes there is provided a space into which air from the said air boxes is admitted.

An opening to the furnace is formed in said covering plates and is provided with tangential ribs or fins, which are located in the air space, to impart a spiral motion to the air as it enters the furnace through the opening. Closing plates are fitted below the dead plate so that the space below the fire-hole chamber, in which the atomizer is located, is common with the aforesaid air space above the dead plate.

According to this invention the aforesaid air boxes are dispensed with and the covering plates are secured to and at a suitable distance behind the furnace front plate which is provided with valve controlled ports through which air is admitted into the space between these plates.

The opening in the furnace is formed in the covering plates and is surrounded by

angled vanes or the like which extend from the covering plates to the furnace front plate.

In addition to these vanes or the like the covering and closing plates are provided with projecting ribs or fins which are so arranged that some of the air from the space below the fire-hole chamber travels direct between the angled vanes through the furnace opening while the remainder of the air is constrained to travel over the surface of the covering plates before commingling with the air admitted to the air space through the upper valve controlled ports of the front plate.

This mixed air from the lower and upper portions of the furnace front passes between the upper angled vanes or the like into the furnace through the furnace opening.

The atomizer which is located within the fire-hole chamber with its nozzle end behind the front plate is surrounded by a fixed sleeve provided with a baffle plate. Between the end of the fixed sleeve and the fire-hole chamber door a sliding sleeve valve is arranged so as to control the supply of air admitted behind the atomizer nozzle from the space between the baffle plate and the fire-hole chamber door.

In order that our said invention and the manner of carrying the same into effect or practice may be properly understood we have hereunto appended one sheet of explanatory drawings in which:—

Figure 1 illustrates a section through the improved furnace front.

Figure 2 is an end view, shown broken away for convenience of illustration, looking on the covering and closing plates.

Figure 3 is a sectional elevation also shown broken away, and taken on the line 3—3 of Figure 1.

Referring to these drawings:—

In carrying this invention into effect or practice *a* represents the covering plates bolted to the furnace front plate *b* by means of bolts *c*. The covering plates *a* form with the front plate *b* an air space *d* which is in communication with the ports and passages *e* controlled by the valve *f*. This valve *f* also controls the supply of air to the ports or passages *g* round the fire-hole chamber *h*. *i* represents the furnace closing plates shaped or angled to align with the covering plates *a* and united thereto by flanges *j*. The

air passing to the lower portion of the furnace front is controlled by the valves or louvres *k*. *l* represents the outlet to the furnace provided in the covering and closing plates. Angled vanes *m* are arranged round the said outlet. Ribs or fins *n* are provided on the covering and closing plates in order to direct the air in a circuitous manner over the covering and closing plates before being tangentially projected through the opening *l* into the furnace *o*. A screen plate *p* is also provided so as to direct the air to the lower part of the closing plates *i*. The liquid fuel atomizer *q* penetrates the furnace door *r* and lies within the fire-hole chamber *h* concentric with the opening *l* to the furnace *o*, the outlet from the said atomizer *q* being to the rear of the covering and closing plates *a* and *i*. A so-called "dead plate" (not shown) is positioned in the furnace *o* at substantially the level of the bottom of the fire-hole chamber or furnace opening *l*. A sleeve *s* encloses the free end of the atomizer *q*, and it is supported in spaced relation to the door *r* by a baffle plate *t* which is also rigidly secured in spaced relation to the door *r* by bolts *v*. The baffle plate is of such dimensions and so positioned as to cause the air from the ports *g* to pass only through the sleeve *s* from the end adjacent to the fire door *r*. The open space between the end of the sleeve *s* and the fire door *r* may be varied to control the air passing through the sleeve *s* by an additional sleeve *u* slidably mounted within the sleeve *s*. The baffle plate thus prevents the air from passing in front of the nozzle, causing it to be admitted through the variable sleeve valve *u* to the portion of the sleeve *s* behind the nozzle *q*. Motion of the sleeve *u* from the outside may be effected through rods *x* having one end secured to the sleeve *u* and the other end extending through the fire door *r*, as shown in Figures 1 and 2 of the drawing. *v* represents the ash-pit door.

The method of working will be as follows:—

The valve *f* controlling the supply of air to the upper portion of the furnace admits air through the ports or passages *g* to the fire-hole opening *h* behind the baffle plate *t* and also by means of the ports or passages *e* to the air space *d*.

The valves *k* control the supply of air to the lower portion of the furnace and admit air to that portion of the furnace forward of the screen plate *p*, where it passes below the said screen plate. A portion of the air from below the plate *p* is tangentially projected through the opening *l* into the furnace *o* while the remainder is, by means of the ribs and fins *n* directed in a circuitous manner over the covering and closing plates. In its passage over these covering and closing plates the air extracts additional heat

and prevents the said plates from becoming over-heated.

The air issuing from the ports or passages *e* unites with the air from the lower portion of the furnace and the whole is projected in the form of a whirling stream by means of the vanes *m* through the opening *l* into the furnace *o* mixing with the atomized liquid fuel from the atomiser *q* in its passage thereto.

We claim:—

1. In a furnace front, the combination with furnace front plates, of back plates rigidly secured to said front plates to define a closed air space, said front and back plates having openings forming a continuous passage therethrough, a hollow closure for the openings in said front plates forming a fire hole chamber, an atomizer positioned in said fire hole chamber adapted to discharge through said continuous opening, means for directing a supply of air to the upper and lower portions of said air space, means for diverting part of the air supplied to said lower portion of said air space to the upper portion of said air space over said back plates, whereby the same may be heated prior to mixing with the upper air supply, and means disposed about said plate openings for swirling the air as it enters said continuous passage.

2. In combination, a furnace having an end portion, means co-operating with said end portion for defining an air chamber, said means having a furnace opening therein, means for supplying air to the portion of said chamber above said furnace opening, means for supplying air to the portion of said chamber below said furnace opening, means for directing a portion of the air supplied below said furnace opening to the portion of said air space above said furnace opening and means for swirling the air as it enters said furnace opening.

3. In combination, a furnace having an end portion, means co-operating with said end portion for defining an air chamber, said means having a furnace opening, said end portion having a fire hole opening, a casing surrounding said fire hole opening and forming a fire hole chamber, means for admitting air in portions of said air space opposite said openings, means for directing a part of the air supplied to one portion of said air space in a circuitous manner over said heated furnace end portion to the other supplied portions of said air space, and means for swirling the air as it enters said furnace opening.

4. In combination a furnace having an end portion provided with a fire hole opening, means co-operating with said end portion for defining an air chamber, said means being adapted to be heated by the action of the furnace, said means also having a furnace

opening therein, a casing surrounding said fire hole opening and forming a fire hole chamber, an atomizer positioned in said fire hole chamber, means for supplying air to portions of said air space above and below said openings, means positioned in said air chamber for causing part of the lower air supply to be united with the upper air supply and vanes disposed tangentially around said openings, whereby the air supplied to said air chamber may be given a swirling motion as it leaves the same.

5. In a furnace front having an end portion provided with a fire hole opening, the combination with an atomizer having a free end disposed in alignment with said fire hole opening, of a casing surrounding said atomizer, said casing forming a fire hole chamber, a rigidly positioned sleeve surrounding said atomizer, a baffle plate on said sleeve and a telescoping sleeve on said first-mentioned sleeve constituting an air valve for controlling the air supplied to the rear of the free end of said atomizer.

6. In a furnace front having an end portion provided with a fire hole opening, the combination with an atomizer having a free end disposed in alignment with said fire hole opening, of a casing surrounding said atomizer, said casing forming a fire hole chamber, a rigidly positioned sleeve surrounding said atomizer and spaced from the closed end of said casing, a valve admitting air to the rear portions of said fire hole chamber, a baffle plate on said sleeve and a valve intermediate the end of said sleeve and the closed end of said casing for controlling the air entering said sleeve from said valve.

7. In combination, a furnace having an end portion provided with a fire hole opening, means co-operating with said end portion for defining an air chamber, said means being adapted to be heated by the action of the furnace, said means also having a furnace opening therein, a casing surrounding said fire hole opening and forming a fire hole chamber, an atomizer positioned in said fire hole chamber, and having a free end disposed in alignment with said fire hole opening, a rigidly positioned sleeve surrounding said atomizer and spaced from the closed end of said casing, a valve admitting air to the rear portions of said fire hole chamber, a baffle plate on said sleeve, a valve intermediate the end of said sleeve and the closed end of said casing for controlling the air entering said sleeve from said valve, means for supplying air to portions of said air space above and below said openings, means positioned in said air chamber for causing part of the lower air supply to be united with the upper air supply and vanes disposed tangentially around said openings, whereby the air supplied to

said air chamber may be given a swirling motion as it leaves the same.

8. In a furnace front of the type hereinbefore described, a furnace front plate having a fire hole opening therein, means secured to the inner surface of said furnace front plate and spaced therefrom in such manner as to form an air chamber, said means also having a furnace opening, an upper and lower air supply disposed behind the furnace front plate above and below the level of the dead plate, vanes arranged tangentially around said furnace opening, ribs or fins integral with said means adapted to unite a portion of the lower air supply with the upper air supply, a casing forming a fire hole chamber surrounding said fire hole opening, an atomizer located therein, a fixed sleeve surrounding said atomizer, a baffle plate on said sleeve and a slidable sleeve valve between the end of said fixed sleeve and the closed end of said casing.

9. In a furnace front of the type hereinbefore described, a furnace front plate having a fire hole opening therein, means secured to the inner surface of said furnace front plate and spaced therefrom in such manner to form an air chamber, said means also having a furnace opening, an upper and lower air supply disposed behind the furnace front plate above and below the level of the dead plate, vanes arranged tangentially around said furnace opening, ribs or fins rigidly secured to said means for uniting a portion of the lower air supply with the upper air supply, an annular wall substantially co-axially positioned with respect to said fire hole opening and extending outwardly from said furnace front plate, a fire hole chamber door closing the outer end of the chamber defined by said annular wall, an atomizer positioned in said last-mentioned chamber, a rigidly positioned sleeve surrounding said atomizer and spaced from the closed end of said casing, a valve admitting air to the rear portions of said fire hole chamber, a baffle plate on said sleeve, and a valve intermediate the end of said sleeve and the closed end of said casing for controlling the air entering said sleeve from said valve.

10. In combination, a furnace end portion comprising front plates, cover plates rigidly secured to the inner surface thereof in such manner as to define an air space, said cover plates and said front plates having substantially aligned perforations, vanes disposed tangentially around said openings, an upper and lower air supply disposed, respectively, above and below said openings, means for deflecting the air admitted through said lower air supply to the extreme lower part of said air space, ribs secured to said cover plates for causing a portion of the lower air supply to be

united with the upper air supply, passing over said cover plates, a casing enclosing said opening in said front plates, said upper air supply also having access to a predetermined portion of said casing.

11. In combination a furnace having an end portion provided with a fire hole opening, means co-operating with said end portion for defining an air chamber, said means also having a furnace opening therein, a casing surrounding said fire hole opening and forming a fire hole chamber, an atomizer positioned in said fire hole chamber, a valve mechanism secured to said casing for

supplying, at will, air to the upper portion of said air chamber and to a predetermined portion of said casing, additional valve mechanism for supplying, at will, air to the lower portion of said air chamber, means positioned in said air chamber for causing part of the lower air supply to be united with the upper air supply and vanes disposed tangentially around said openings, whereby the air supplied to said air chamber may be given a swirling motion as it leaves the same.

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