D. JONES.

BOILER AND OTHER FURNACE.

APPLICATION FILED JULY 1, 1913.

1,166,911.

Patented Jan. 4, 1916.

FIG. 1

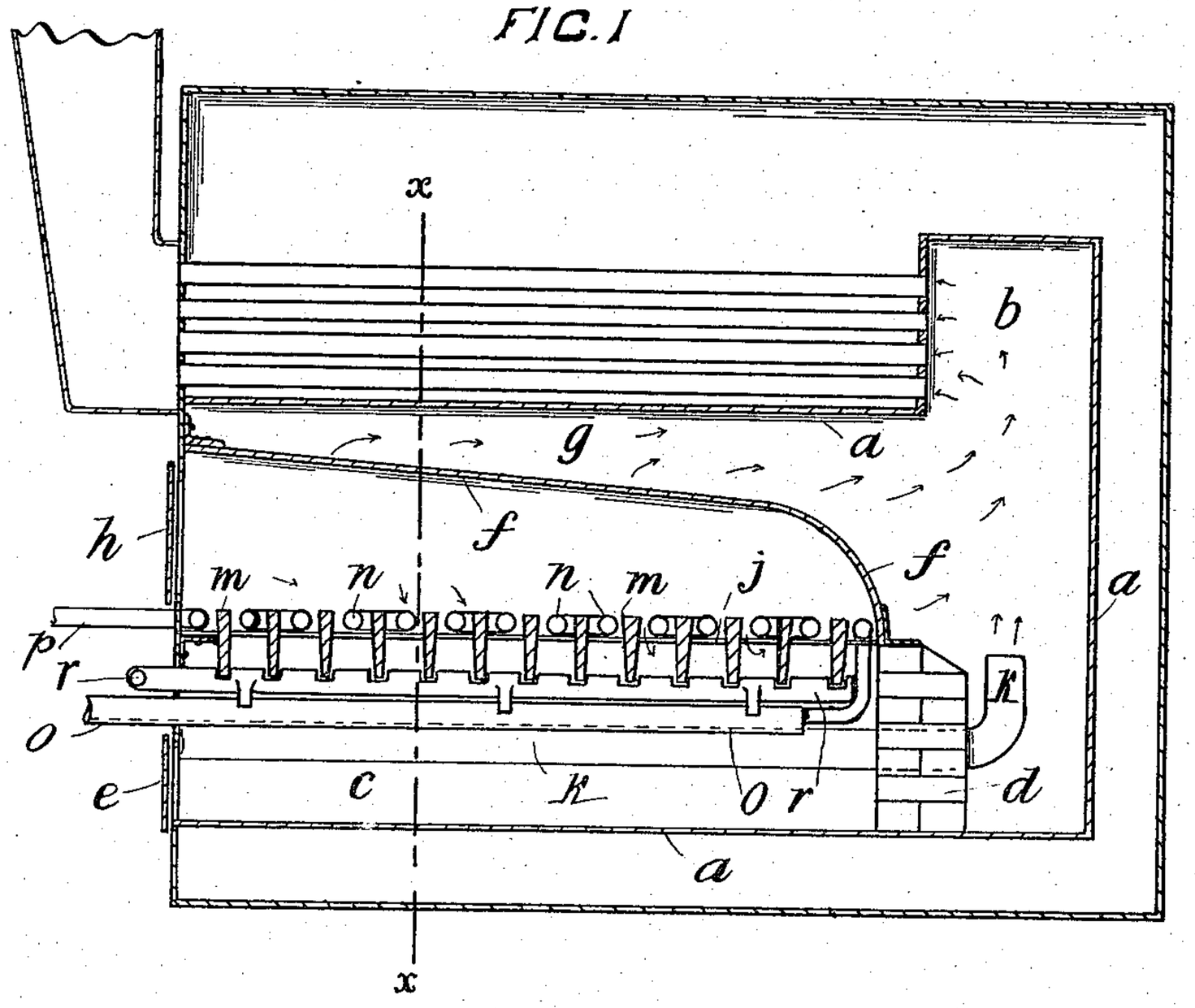


FIG. 2

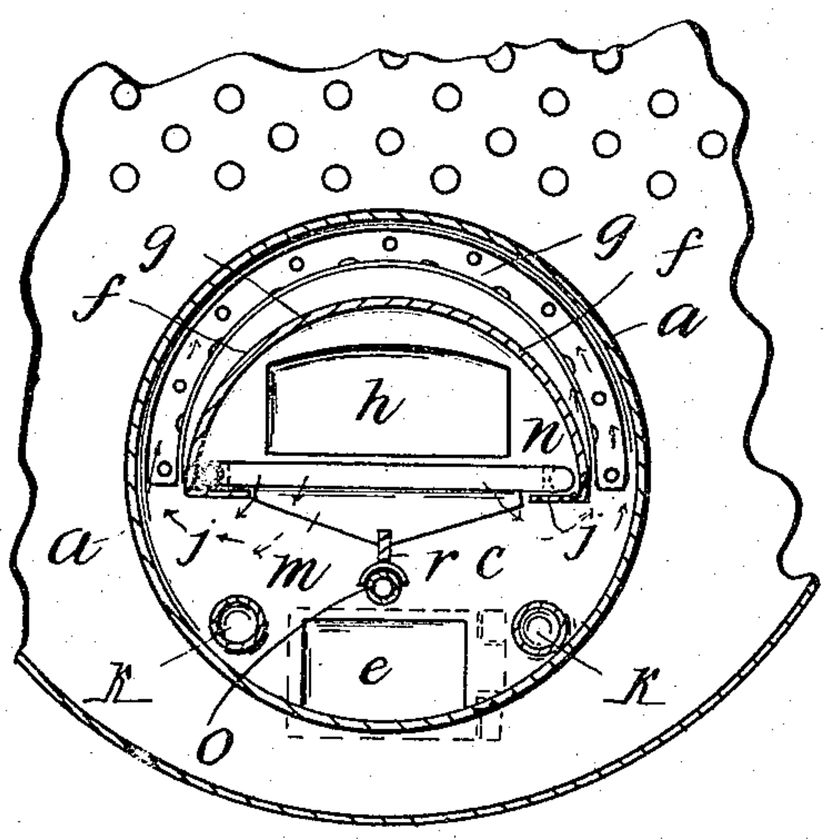
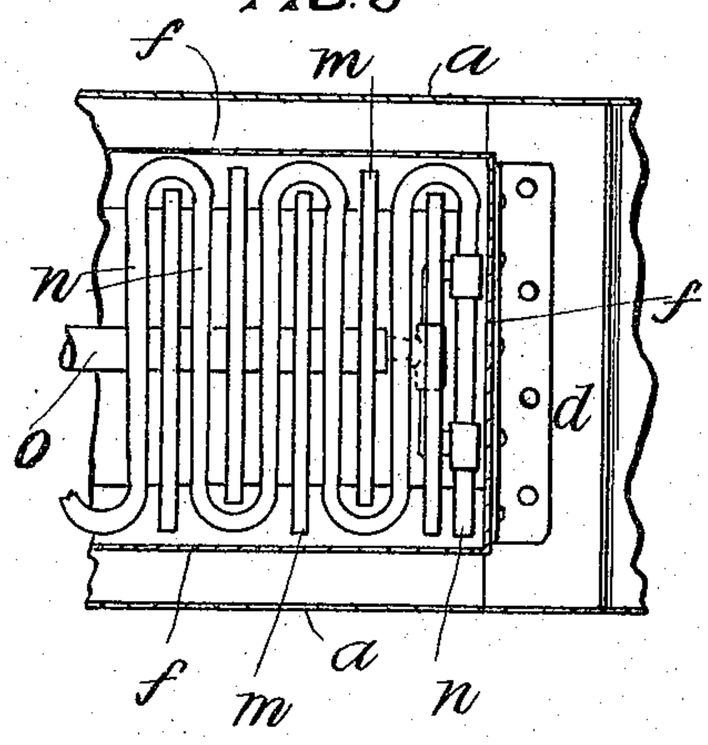


FIG. 3



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UNITED STATES PATENT OFFICE.

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BOILER AND OTHER FURNACE.

1,166,911. Specification of Letters Patent. Patented Jan. 4, 1916.

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To all whom it may concern:

Bt it known that I, DAVID JONES, subject of the King of Great Britain, residing at Whareora, New Zealand, have invented a new and useful Improvement in Boiler and Other Furnaces; and I do hereby declare the following to be a full, clear, and exact description of the same.

My invention has for its object to provide for a more complete combustion of the fuel in boiler and other furnaces so as thereby to economize in the use of the fuel.

My invention also provides against any entry of cold air into the furnace flues during the operation of stoking with the consequent lowering of the temperature and the carrying of unburnt products of combustion and smoke from the furnace to the flues.

According to my invention the furnace chamber is covered in by a hood of boiler plate or other suitable material curving over its top and extending downward on both sides at a distance from the walls of the chamber to leave clear spaces between. The hood also curves down at its back end and rests upon the bridge so as to close the back of the furnace space. The back end of the ash pit is closed by the bridge and the front end is closed in so as to shut off the supply of air to beneath the fire bars. The hood is open at its front end and fits around the furnace door opening. Provision is made for the entry of air, either by forced draft or otherwise, into the space beneath the hood.

In the operation of the furnace the air introduced into the space above the bars will pass down through the bars into the ash pit and then up outside each side of the hood into the combustion chamber. These currents of air will thus pass through the fire upon the fire bars and carry the heat thereof through with them to the combustion chamber. Consequently the smoke and other products given off will be carried through the burning fuel and thereby completely consumed. Combined with these means is a special arrangement and construction of fire grate by means of which the gases passing down through the fuel and fire grate are kept cool in order to prevent their complete combustion while beneath the grate and thereby save the grate from the excessive heat action that would otherwise result from the combustion of the gases adjacent thereto. Means are also provided whereby independent currents of heated air are introduced into the combustion chamber of the furnace to mingle with the hot air and gases and other products of combustion given off by the furnace and cause the complete combustion thereof in such chamber.

My invention is illustrated in the accompanying drawings, in which—

Figure 1 is a longitudinal section of an ordinary type of boiler fitted with a furnace constructed according hereto. Fig. 2 is a cross section of the furnace taken on the lines *x*—*x* of Fig. 1 and looking to the left thereof. Fig. 3 is a plan of the rear portion of the fire grate.

a represents the ordinary furnace chamber of tubular form leading into a combustion chamber *b*. According to my invention the furnace chamber has its ash pit *c* closed at the rear end by means of a solid bridge *d* and also closed at its front end to prevent the entry of air. An ash door *e* is provided at the front end.

f is the hood which is made of semi-cylindrical shape and fixed concentrically within the upper half of the furnace chamber *a* so as to leave an annular space *g* between it and the wall of such chamber. This hood at its front end is fastened on to the inside of the boiler shell and surrounds the fire door *h*. At its back end it slopes downward and rests upon the bridge *d*. The two bottom edges of the hood are turned inward to form ledges *j* upon which the fire grate is supported. The hood and grate thereby inclose a fire space within the furnace chamber and communicated with through the door *h*. Air being prevented from passing through the ash pit, the draft for the furnace will therefore pass in through the furnace door *h* along beneath the hood *f*, down through the fire grate and up between the hood and the wall of the furnace chamber and thence to the combustion chamber. When therefore fuel is placed on the grate it will burn downward, the smoke and other products being carried down through the fire so as to be completely consumed, the heat thereof being carried up and around the inside of the furnace chamber to heat it in the usual way.

Currents of heated air are led into the combustion chamber to mingle with the heat from the furnace and thus aid its combustion. For this purpose pipes *k* are led from the front end of the furnace chamber along

within the ash-pit and then through the bridge *d* and up into the combustion chamber. The flames and heat from the furnace will act on these pipes so as to heat the air passing through them. The front ends of these pipes may be provided with suitable dampers by means of which the passage of air through them may be controlled.

In this invention the fire grate is comprised of fire bars *m* of ordinary construction arranged alternately with hollow fire bars *n*. These latter bars may be formed of piping and are all connected together in the manner shown in Fig. 3 in order to obtain a continuous water passage through them from end to end of the furnace. A water supply pipe *o* leads along beneath the fire grate and is connected to the back end of the series of hollow bars *n*. The front end of such series leads away through a pipe *p*. Thus provision is made for the passage of a supply of cold water through the grate and the hot gases passing down between the bars will travel over the surfaces of the bars containing such water and be kept cool by their contact with such surfaces. These gases will thereby be retarded in their combustion until they reach the combustion chamber and mingle with the hot air introduced through the pipes *k*. This cooling action of the water passing through the bars is governed by the rate at which the water is forced through them. The water will be heated in its passage to some extent and may be used as feed water for the boiler or for any other purpose, its primary object however, being to keep the gases cool.

The grate is kept from choking by arranging the solid fire bars *m* so that they may rock on their ledge supports *j*, and in providing means for so rocking them. These means consist of a notched bar *r* that rests upon the pipe *o* beneath the grate and is capable of sliding to and fro thereon. The front end of this bar projects through the front end of the boiler so that it may be worked by the attendant. The bottom edges of the fire bars *m* fit into the notches in this bar so that when the bar is reciprocated, the fire bars will be rocked on their bearings and thereby loosen and free the spaces between them and the fixed hollow bars from any ashes or other choking matter.

What I do claim as my invention, and desire to secure by Letters Patent is:—

1. In boiler and other furnaces the combination with a cylindrical furnace box, of an ash pit, a bridge at the rear end of said ash pit, a hood concentrically arranged within said furnace box so as to leave an annular space between its top and sides and the inner wall of said furnace box, said hood being supported with its sloping rear end upon said bridge and fastened at its forward end to the boiler shell.

2. In boiler and other furnaces the combination with a cylindrical furnace box, of an ash pit, a bridge at the rear end of said ash pit, a hood concentrically arranged within said furnace box so as to leave a space between its top and sides, and the inner wall of said furnace box, said hood being supported with its sloping rear end upon said bridge, and air supply pipes within said ash pit extending from the front end of said furnace box and through the bridge at the rear of the ash pit.

3. In boiler and other furnaces the combination with a cylindrical furnace box, of an ash pit, a bridge at the rear end of said ash pit, a hood concentrically arranged within said furnace box so as to leave a space between its top and sides, and the inner wall of said furnace box, said hood being supported with its sloping rear end upon said bridge, and a fire grate supported by the sides of the hood and composed of alternately arranged solid and hollow grate bars, said hollow bars being connected together at their ends to form a continuous water passage.

4. In boiler and other furnaces the combination with a cylindrical furnace box, of an ash pit, a bridge at the rear end of said ash pit, a hood concentrically arranged within said furnace box so as to leave a space between its top and sides, and the inner wall of said furnace box, said hood being supported with its sloping rear end upon said bridge, and a fire grate supported by the sides of the hood and composed of alternately arranged solid and hollow grate bars, said hollow bars being connected together at their ends to form a continuous water passage, and a notched bar engaging with the bottom edges of the solid grate bars and capable of longitudinal reciprocating movement.

In testimony whereof, I have signed this specification in the presence of two subscribing witnesses.

DAVID JONES.

Witnesses:
E. BROOKS SMITH,
E. F. COURTNEY.