(No Model.)

R. LE LAS & A. ROBIN.

FURNACE.

No. 411,865. Patented Oct. 1, 1889.

Fig. 3

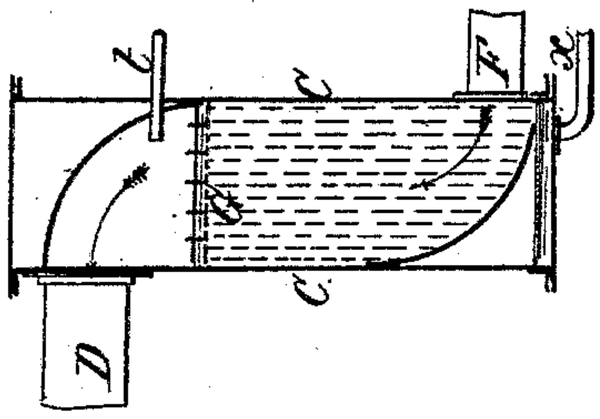


Fig. 2

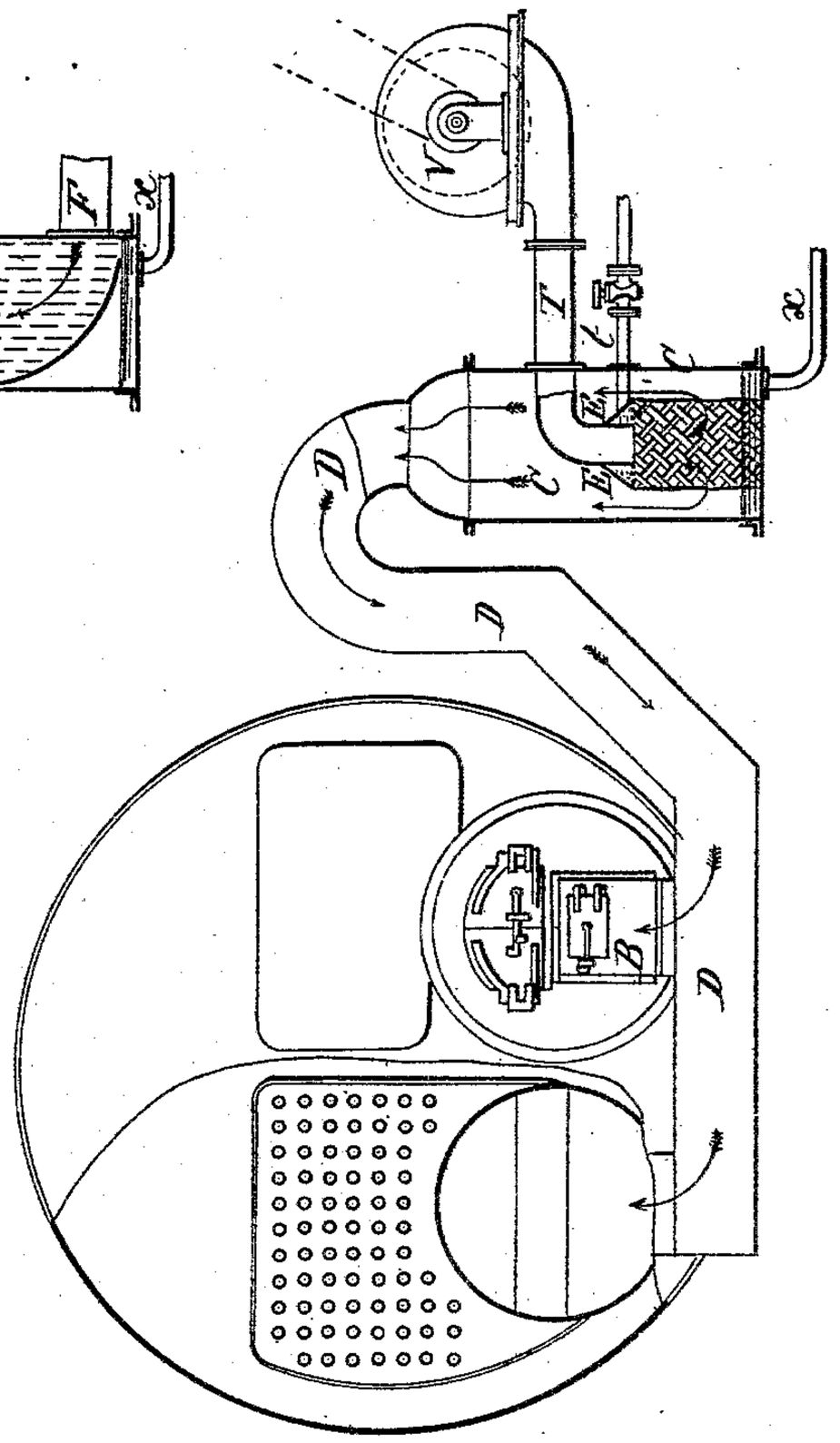


Fig. 5

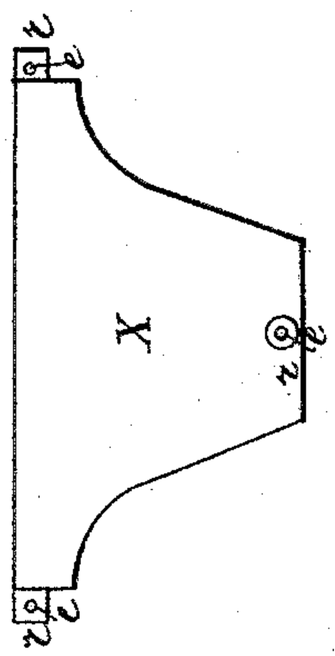
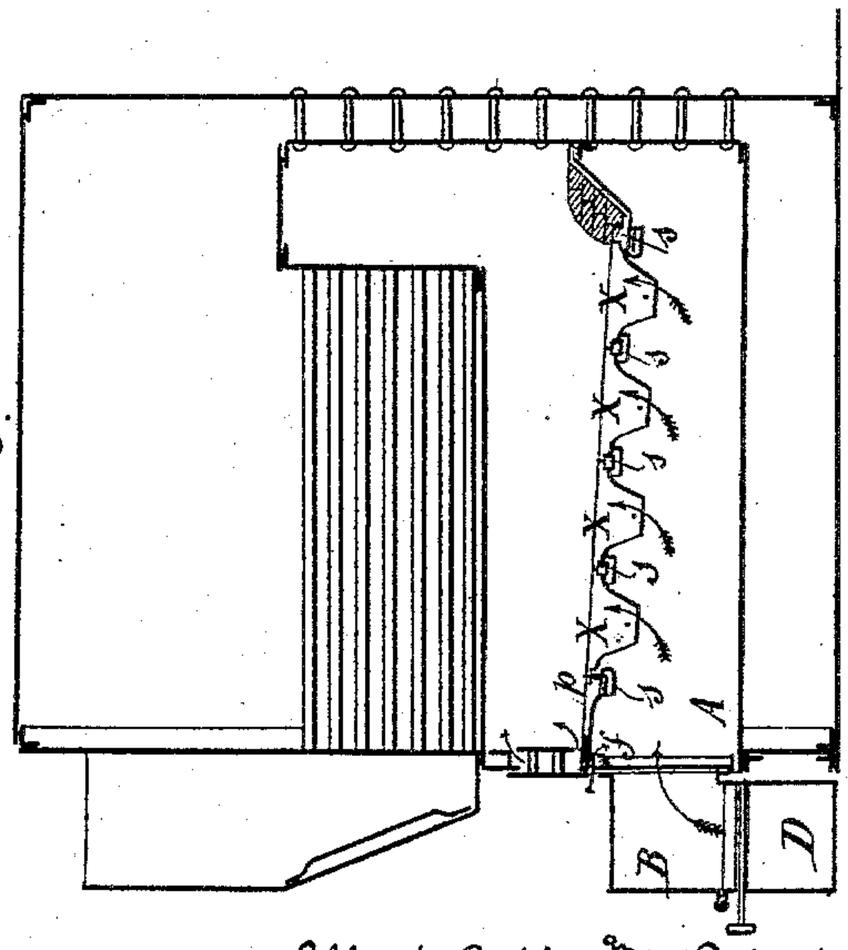


Fig. 4

Fig. 1



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UNITED STATES PATENT OFFICE.

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FURNACE.

SPECIFICATION forming part of Letters Patent No. 411,865, dated October 1, 1889.

Application filed July 12, 1888. Serial No. 280,140. (No model.) Patented in England April 13, 1888, No. 5,527.

To all whom it may concern:

Be it known that we, ROBERT LE LAS, a citizen of the Republic of France, residing at Walnut Tree, near Cardiff, England, and ALBERT ROBIN, a citizen of the Republic of France, residing at Paris, France, have invented certain new and useful Improvements in Furnaces for Burning Small Fuel, of which the following is a specification.

This invention has been patented in Great Britain by Letters Patent dated April 13, 1888, No. 5,527.

The combustion of small fuel upon a furnace-grate involves two essential conditions—viz., first, reducing to the minimum the spaces between the grate-bars, while still furnishing space amply sufficient for the passage of the air necessary for the combustion; second, by reason of the nature of the coal, which necessitates contracted spaces between the grate-bars, it is necessary to convey the air under the grate by force in order to pass it through the bed of fuel; but under the influence of a forced blast the combustion is carried on at a high temperature, and hence the grate-bars become clogged by the clinkers, which adhere thereto and obstruct the passage of the air.

It has hitherto been proposed to cool the grate-bars by the circulation of water; but the means heretofore employed have necessitated very complicated arrangements and constructions of the grate-bars, supply-ducts, &c. We, however, here propose to present a system for grates which permits the effecting of the combustion by a forced air-blast, and which at the same time insures the cooling of the grate-bars. This last result is obtained by previously rendering the air moist before it is brought beneath the grate. This moist air arriving under the grate, the water with which it is charged is vaporized on contact with the grate-bars, and in consequence it lowers the temperature. The clinkers hence do not adhere to the grate-bars and the grate is maintained in proper condition. In order to effect this introduction of moist air, we cause the air furnished by a blower, fan, bellows, or other convenient air-pump to pass through a current or spray of water, which saturates the air with a sufficient moisture before it arrives beneath the grate.

As an example, and in order to make our invention clearly understood, we have illustrated in the accompanying drawings our system applied to a furnace for generating steam.

Figure 1 is a longitudinal section of the grate. Fig. 2 is a face view of the front of the furnace and a section of the apparatus which moistens the air to be supplied to the furnace. Fig. 3 is a sectional view of a modified air-moistening apparatus. Figs. 4 and 5 are end and side views, respectively, of the sections composing the grate-bars.

The air necessary for the combustion furnished by a fan V is introduced under the grate G by an air-inlet channel B, which is affixed to the front of the ash-box A or at any other convenient location. This air-channel may be removed for the withdrawal of the ashes and the clearing of the ash-box. Between the fan and the fixed air-inlet channel is located the apparatus for moistening the air, which is susceptible of a variety of constructions. When the system is to be applied to a marine boiler, we prefer to adopt the arrangement shown in Fig. 2 of the drawings, because it is not affected by the variations in the inclination of the surface of the water in the apparatus, and it insures a uniform and constant moistening action. The air arrives from the fan V through a pipe T, bent around into a metal casing C, from the upper part of which a discharge-pipe D for the air leads to the air-inlet channel B. The open end of the pipe T within the casing C is surrounded by a funnel-shaped box or frame E, into which is introduced water by a pipe *t*, and into which the water falls in a shower or spray all around the open end of the air-inlet pipe T. The air forced out of the pipe T in order to pass out through the discharge-pipe D is obliged to pass through the liquid sheet, and is thus charged with water. The water which falls to the bottom of the casing C is carried off by a pipe *x*.

In order to diminish as far as possible the amount of water to be supplied, it is useful to place upon the funnel-shaped box or frame E, reaching down to the bottom of the casing C,

coarsely-woven cloths or fabrics, which by capillary attraction will retain water in their meshes, whereby the air will be obliged, in passing through the cloths, to become saturated with moisture.

In case the apparatus is to be adapted to stationary boilers, the casing can be arranged for moistening the air as shown in Fig. 3. The air enters into the casing by a pipe F at the bottom and passes out through the pipe D at the top, as in Fig. 2. In the interior of this casing, near the top, is arranged a perforated sheet-metal plate G, which receives water from the pipe *t*. The water falls in a spray through the perforations in the plate G in a direction opposite to the movement of the air throughout the height of the casing. By suitably regulating the velocity of the incoming air there can be given to the air the desired degree of moistness.

The grate is formed of bars constructed as is shown on a larger scale in Figs. 4 and 5. The bars X are made of thin sheet metal, of great height as compared with their thickness, and they are maintained at the desired distance apart by means of sheet-metal washers *r* interposed between them. The bars X are bound together in groups of any desired number (five, the number shown, being a suitable number) by means of tie-bars *e* riveted thereto. These groups of bars are arranged in the fire-box in the usual manner, and rest upon transverse beams *s*. The bars may, however, be arranged transversely and the beams longitudinally equally well. The grate-bars of this described construction are especially suitable for marine boilers, where it is necessary to attain a maximum power in a confined space, the great height given to the bars resulting in presenting the greatest possible surface for the contact of the moist air.

With furnaces supplied with a forced air-blast, in which the combustion is very active, it often happens that the furnace-doors become highly heated. This causes a rapid deterioration of the doors and much suffering for the fireman. We avoid this inconvenience and annoyance by forming in the cross-plate *p* in front of the grate a vent-passage *f*, through which can pass a small quantity of the moist air introduced under the grate. The furnace-door has double walls, and the vent *f* communicates with the space between the walls. The air thus enters this space and cools the door, and, being itself there heated, passes out into the combustion-chamber above the burning fuel, assisting in consuming the smoke whenever soft coal is employed. The vent *f* is controlled by a door or valve which may be adjusted by the fireman at will to regulate the passage of moist air into the interior of the door.

A portion of the air passing through the fan can be carried into the boiler and engine rooms, thereby ventilating the same and lowering the temperature, which ordinarily is so trying and fatiguing to the engineers and firemen.

For large plants comprising a number of steam-generators there may be employed, instead of a fan, an air-pump for forcing the air into a reservoir having a number of branch pipes leading to the several fire-boxes of the different generators.

We claim as our invention—

1. The grate of a furnace and an air-pump for supplying air under pressure beneath said grate, in combination with an intervening air-moistening device consisting of a casing, an air-inlet leading from the pump and conducting air to the lower part of the casing, an air-outlet to the furnace, leading from the upper part of the casing, whereby the air under pressure is forced upwardly through the casing, a water-inlet pipe entering the upper part of the casing, and a water-distributer adapted to subdivide the water and cause it to descend through the casing in such manner as to intercept and mingle with the ascending air, whereby the latter is caused to pass through the descending water and become thoroughly moistened thereby.

2. The grate of a furnace and an air-pump for supplying air beneath the same, in combination with a casing, an air-inlet pipe leading from the pump to the casing, an air-outlet pipe leading from the casing to the furnace, a cloth or fabric arranged within the casing to be traversed by the air in passing from the inlet to the outlet pipes, and a water-inlet conducting water to said fabric to keep it saturated, substantially as set forth.

3. The grate of a furnace and an air-pump for supplying air beneath the same, in combination with a casing, an air-inlet pipe leading from the pump to the casing, an air-outlet pipe leading from the casing to the furnace, a frame or box within the casing inclosing the mouth of the air-inlet pipe, a cloth or fabric covering said frame or box, and a water-inlet pipe conducting water to said casing for keeping said cloth saturated, substantially as set forth.

In witness whereof we have hereunto signed our names in the presence of two subscribing witnesses.

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ALBERT ROBIN.

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