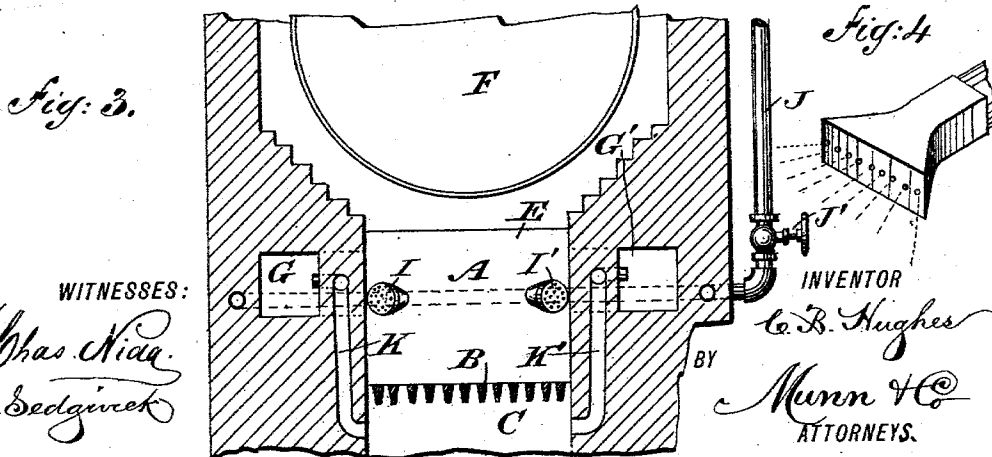
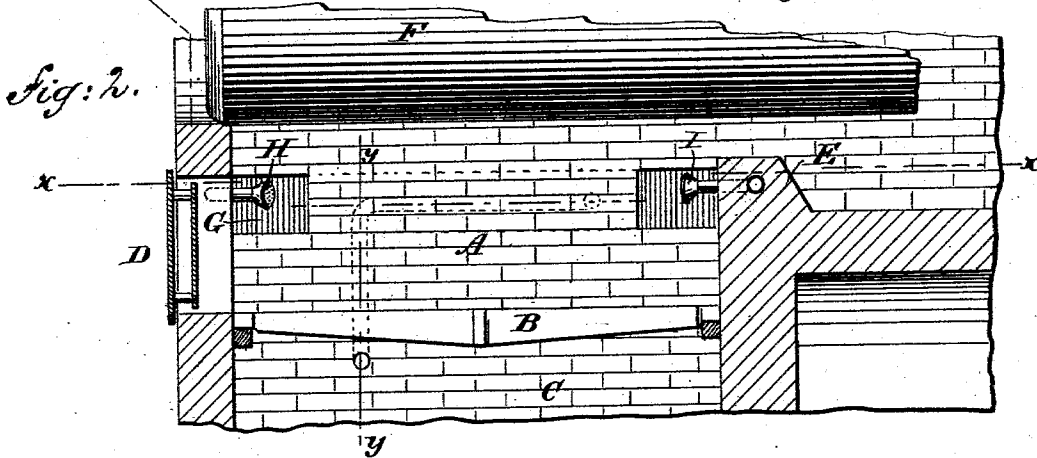
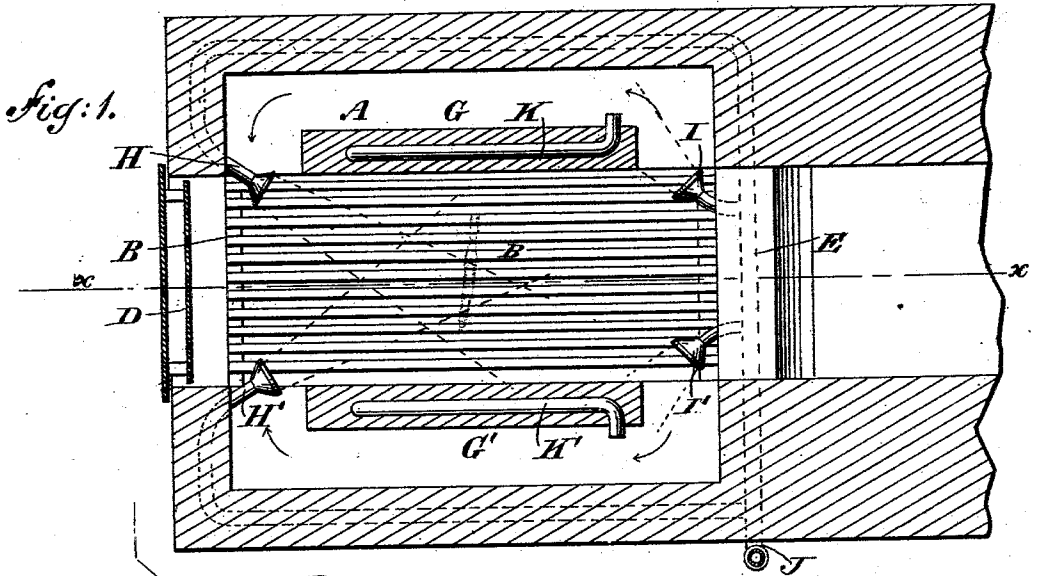


(No Model.)

C. B. HUGHES.
FURNACE.

No. 469,664.

Patented Feb. 23, 1892.



UNITED STATES PATENT OFFICE.

CHRISTIAN B. HUGHES, OF NILES, OHIO.

FURNACE.

SPECIFICATION forming part of Letters Patent No. 469,664, dated February 23, 1892.

Application filed May 20, 1891. Serial No. 393,444. (No model.)

To all whom it may concern:

Be it known that I, CHRISTIAN B. HUGHES, of Niles, in the county of Trumbull and State of Ohio, have invented a new and Improved Furnace, of which the following is a full, clear, and exact description.

The object of the invention is to provide a new and improved furnace which is simple and durable in construction, very effective in operation, insures complete combustion, and materially reduces the necessary amount of fuel for getting up steam or producing heat for any other purposes.

The invention consists of certain parts and details and combinations of the same, as will be hereinafter fully described, and then pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a sectional plan view of the improvement on the line *xx* of Fig. 2. Fig. 2 is a sectional side elevation of the same on the line *xx* of Fig. 1. Fig. 3 is a transverse section of the same on the line *yy* of Fig. 2, and Fig. 4 is a perspective view of one of the nozzles.

The improved furnace is built of brick or other suitable material and is provided with the fire-box A, containing the grate B, below which is arranged the usual ash-pit C. On the front end of the fire-box A is arranged the usual fuel-inlet door D, and at the rear of the said fire-box is the usual bridge-wall E, below the boiler F, of suitable construction.

In the side walls of the fire-box A are arranged longitudinally-extending chambers or channels G and G', opening at their ends into the fire-box, as plainly shown in Figs. 1 and 2, the inlet-openings being above the grate B and in that part of the fire-box in which the combustion takes place. In the front wall of the fire-box A are arranged the nozzles H and H', adapted to discharge superheated steam obliquely in the fire-box above the grate B and about in line with the chambers G and G'. A similar set of discharge-nozzles I I' is arranged in the rear of the fire-box below the upper end of the bridge-wall and in line with the rear openings of the channels G and G', the said nozzles discharging obliquely across

the rear end of the fire-box into the rear openings of the said channels. In that part of the wall extending between the channels and the fire-box are arranged air pipes or ducts K and K', leading from the ash-pit into the said channels, so as to supply the latter with heated fresh air. The nozzles H, H', I, and I' are connected by suitable pipes with a pipe J, connected with the steam-dome of the boiler, so as to supply the said nozzles with the necessary amount of superheated steam. A valve J', held in the said pipe J, serves to regulate the amount of superheated steam passing to the said nozzles. The nozzles H, H', I, and I' are preferably provided with a single row of perforations, as illustrated in Fig. 4, so that the discharge of steam can be more readily directed in the desired direction.

The operation is as follows: When the fuel on the grate B is burning and the operator opens the valve J', then jets of steam pass through the sets of nozzles H H' and I I' over the burning fuel, the jets from the front nozzles H and H' driving the burning gases, smoke, &c., rearwardly, while the jets of steam from the nozzles I I' force the smoke, gases, &c., into the rear openings of the channels G and G', so that the said gases are moved in the said chambers or channels and mixed with the hot air from the pipes K and K', the mixture again entering the front end of the fire-box to be burned over the burning fuel. The smoke and gases not consumed at the return into the fire-box are again taken up by the jets of steam issuing through the nozzles I and I', to be again driven through the channels G and G' to the front end of the chamber to be forced over the burning fuel by the jets from the nozzles H and H'. Thus it will be seen that by this continuous operation a complete combustion of all the gases is insured.

Having thus fully described my invention, I claim as new and desire to secure by Letters Patent—

1. In a furnace, the combination, with a fire-box provided with chambers connected at their ends with the front and rear ends of the sides of the combustion-chamber in front of the bridge-wall, of sets of nozzles adapted to discharge laterally through the said walls

steam in the combustion-chamber to force the gases into the rear end of the said chambers, through the latter, and out at the front ends to return the gases into the front end of the combustion-chamber, substantially as shown and described.

2. A furnace comprising a fire-box having a combustion-chamber and side gas chambers or channels extending longitudinally in the side walls of the fire-box, the ends of each chamber discharging laterally through the said walls into the front and rear ends of the combustion-chamber in front of the bridge-wall, substantially as shown and described.

3. A furnace comprising a fire-box having a combustion-chamber and side gas chambers or channels extending longitudinally in the side walls of the fire-box, the ends of each chamber discharging laterally through the said walls into the front and rear ends of the combustion-chamber in front of the bridge-wall, and a set of converging nozzles arranged to discharge jets of steam into and diagonally across the front end of the said combustion-chamber in close proximity to the front ends of the said side gas-chambers to create a draft therein, substantially as shown and described.

4. A furnace comprising a fire-box having a combustion-chamber and side gas chambers or channels extending longitudinally in the side walls of the fire-box, the ends of each chamber discharging laterally through the said walls into the front and rear ends of the combustion-chamber in front of the bridge-wall, and a set of nozzles arranged in the rear end of the combustion-chamber and adapted to discharge jets of steam into the rear ends of the said side gas-chambers, substantially as shown and described.

5. A furnace comprising a fire-box having

a combustion-chamber and side gas chambers or channels extending longitudinally in the side walls of the fire-box, the ends of each chamber discharging laterally through the said walls into the front and rear ends of the combustion-chamber in front of the bridge-wall, a set of converging nozzles arranged to discharge jets of steam into and diagonally across the front end of the said combustion-chamber in close proximity to the front ends of the said side gas-chambers to create a draft therein, and a second set of nozzles diverging arranged in the rear of the end of the combustion-chamber and arranged to discharge jets of steam into the rear ends of the said side gas-chambers, substantially as shown and described.

6. A furnace comprising a fire-box having a combustion-chamber and side gas chambers or channels extending longitudinally in the side walls of the fire-box, the ends of each chamber discharging laterally through the said walls into the front and rear ends of the combustion-chamber, a set of converging nozzles arranged to discharge jets of steam into and diagonally across the front end of the said combustion-chamber in close proximity to the front ends of the said side gas-chambers to create a draft therein, a second set of nozzles arranged in the rear of the end of the combustion-chamber and arranged to discharge jets of steam into the rear ends of the said side gas-chambers, and air-supply pipes or ducts discharging into the said side gas-chambers, substantially as shown and described.

CHRISTIAN B. HUGHES.

Witnesses:

ISIAH JENKINS,
JAMES B. CAMPBELL.