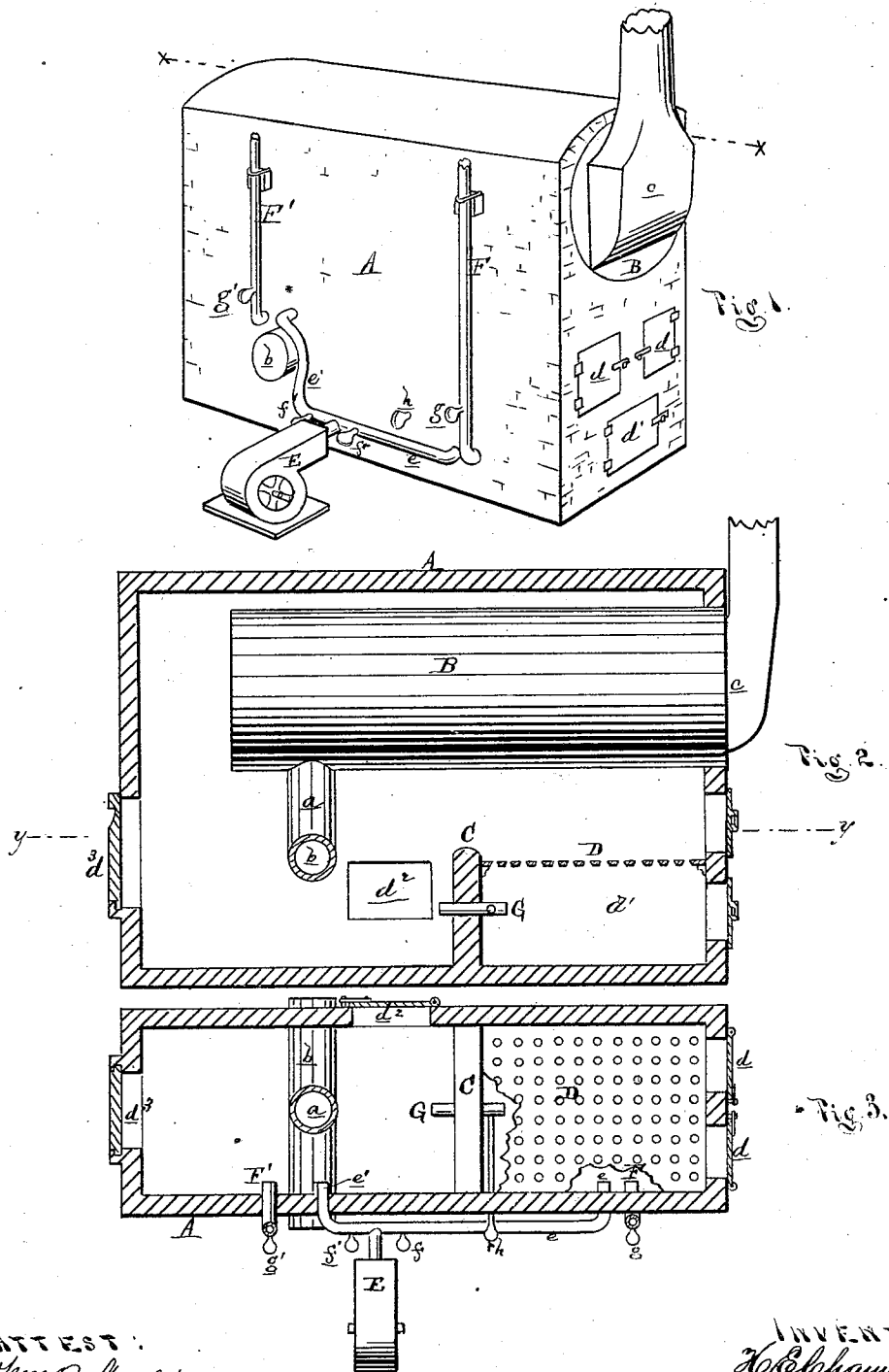


H. E. CHAMPION.
Steam-Boiler Furnace.

No. 159,902.

Patented Feb. 16, 1875.



ATT EST :

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UNITED STATES PATENT OFFICE.

HENRY E. CHAMPION, OF DETROIT, MICHIGAN.

IMPROVEMENT IN STEAM-BOILER FURNACES.

Specification forming part of Letters Patent No. **159,902**, dated February 16, 1875; application filed February 16, 1874.

To all whom it may concern:

Be it known that I, HENRY E. CHAMPION, of Detroit, in the county of Wayne and State of Michigan, have invented an Improvement in Steam-Boiler Furnaces, of which the following is a specification:

This invention has for its object to so construct a boiler-furnace that the refuse, screenings, and "slack" of anthracite may be consumed therein for generating steam at a much less cost than it can be done with the more expensive qualities of fuel; and to this end it consists in forcing a blast of air into a tight ash-pit, and at the same time turning in a portion of the exhaust steam from the engine to loosen up and separate the fuel on a perforated plate-grate, allowing the air-blast from the ash-pit to pass up through the incandescent fuel to supply the necessary oxygen to produce combustion. A large portion of the gases, however, are not ignited or consumed in the space in front of the bridge-wall, but pass behind it, where a portion of the air-blast (supplied by a fan) is mingled with them, and preferably a further supply of exhaust steam, which air and steam, mingling with the gases, supply thereto oxygen and hydrogen to produce perfect combustion.

Figure 1 is a perspective view of a boiler and arch, showing the external arrangement of the fan, blast-pipes, and exhaust-steam pipes. Fig. 2 is a longitudinal vertical section at *xx*. Fig. 3 is a horizontal section at *yy*.

In the drawing, A represents the arch, in which is set an ordinary flue or tubular boiler, B, provided with mud-pipe *a*, mud-drum *b*, smoke box and flue *c*, in the usual manner. *d d* are the fire-doors, and *d'* the ash-pit door, which should fit air-tight, and be adapted to resist some little internal pressure. C is the bridge-wall, and D is a grate, formed of one or more plates, and drilled with numerous apertures, which may be about three-eighths of an inch in diameter. E is a blast-fan or pressure-blower, having a branched blast-pipe, *e e'*, the pipe *e* entering the ash-pit, and the pipe *e'* the combustion-chamber back of the bridge-wall. Each blast-pipe is provided with a valve, *f* or *f'*, to regulate the blast delivered into ash-pit and combustion-chamber. F F' are branches, leading or conducting a portion

or the whole of the exhaust steam of the engine, the former delivering its volume to the ash-pit, and the latter to the combustion-chamber. They are, respectively, provided with valves *g g'*.

In practice, it is found that the entire exhaust steam of the engine is not required to produce perfect combustion, in which case the unused portion may be discharged in another direction. G is a pipe leading through the bridge-wall, and is provided with a valve, *h*, regulated from the outside of the arch. *d²* is a door at the side of the arch, through which the ashes are removed from the combustion-chamber. *d³* is a door at the back end of the arch for a like purpose.

The apparatus is shown in connection with a stationary boiler, used for generating steam for a non-condensing engine; but it is equally adapted to marine boilers and condensing-engines, although in this latter case the influx of exhaust steam is substituted by the influx of live steam in intermittent puffs or blasts through proper mechanism actuating the valves for that purpose.

I am aware that steam and air have been injected into boiler-furnaces to promote combustion; but the present invention differs in this, that the intermittent blasts of exhaust steam under the grates, and in a tight ash-pit, raise and break up the agglomerated particles of coal on the grate, allowing the air blown into and through the mass of fuel, where it mingles with the gases, and furnishes the necessary oxygen to secure combustion; but, as hereinbefore stated, the combustion is not complete, although it is as perfect as can be secured with lump coal in the ordinary way of firing; and to promote combustion of the gases, I introduce a second supply of air behind the bridge-wall, where, mingling with the gases, it supplies the oxygen to promote the combustion of the unconsumed gases passing over the bridge-wall; but to make the combustion perfect and complete, I introduce a second steam-blast, as described, which fills the combustion-chamber with a sheet of white flame, giving off no smoke after steam is up and the engine is in motion; but a trifling amount of ashes falls through the grate, nearly all passing over the bridge-wall, and is de-

posited in the combustion-chamber, whence it is removed through the doors d^2 and d^3 . So few clinkers are made that the grate needs cleaning but once a day.

After a fresh supply of fuel on the grate is well ignited, and most of the gases driven off, the pressure in the ash-pit can, with advantage, be decreased by partially opening the valve h in the pipe G through the bridge-wall, increasing the draft thereby in the combustion-chamber.

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

In a steam-boiler furnace, the combination of a perforated grate, a tight ash-pit, a steam-

pipe leading into the ash-pit, and a blower having a branch pipe leading into the ash-pit, and a branch pipe leading into the combustion-chamber back of the bridge-wall, all arranged and adapted to receive a continuous air-blast and an intermittent steam-blast in the closed ash-pit, and a second air-blast in the combustion-chamber back of the bridge-wall, substantially as and for the purpose set forth.

HENRY E. CHAMPION.

Witnesses:

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WM. P. SPALDING.