W. SWINDELL.

FURNACES FOR STEAM BOILERS.

No. 181,222. Patented Aug. 15, 1876.

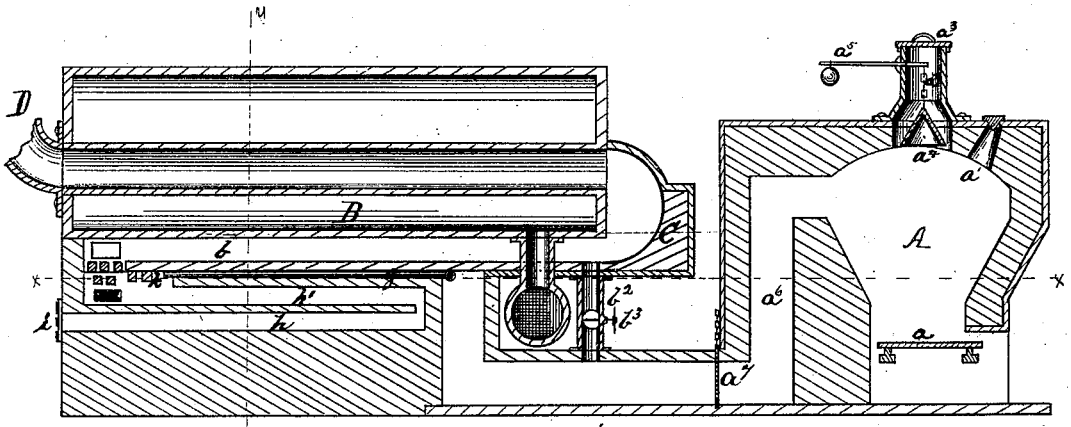

Fig. 1.

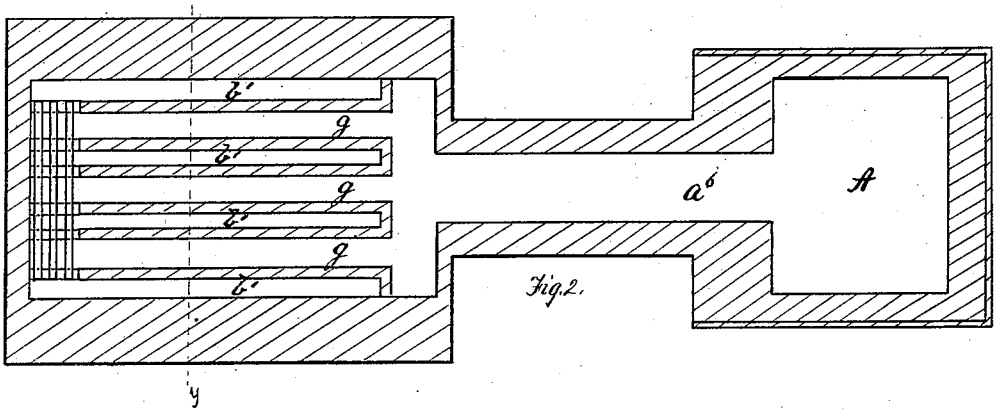

Fig. 2.

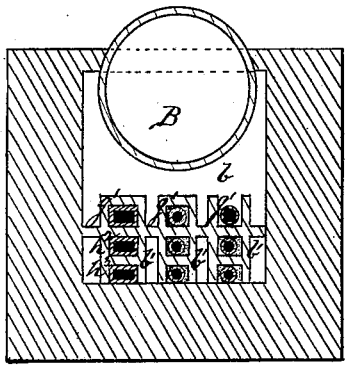

Fig. 4.

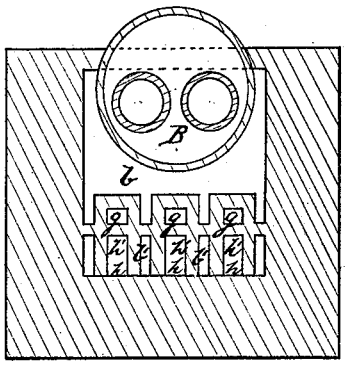

Fig. 3.

Witnesses.

R. H. Trenchard

James L. Kay

Inventor.

William Swindell

by Bakewell & Kerr

Atty's

UNITED STATES PATENT OFFICE.

WILLIAM SWINDELL, OF PITTSBURG, PENNSYLVANIA.

IMPROVEMENT IN FURNACES FOR STEAM-BOILERS.

Specification forming part of Letters Patent No. **181,222**, dated August 15, 1876; application filed June 21, 1876.

To all whom it may concern:

Be it known that I, WILLIAM SWINDELL, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Furnaces for Boilers, Evaporators, and similar purposes; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawing, forming part of this specification, in which—

Figure 1 is a longitudinal vertical section of furnaces and a producer illustrating my invention. Fig. 2 is a longitudinal horizontal section on the line *x x*, Fig. 1, looking from above. Fig. 3 is a transverse section on the line *y y*, showing the several flues as formed from brick. Fig. 4 is a similar section, showing the flues formed by a series of pipes, such a construction being necessary, for reasons hereinafter stated, when natural gas is used.

Like letters refer to like parts wherever they occur.

My invention relates to the construction of furnaces for boilers, evaporating-pans, and like purposes, wherein the fuel employed is of a gaseous nature; and consists in combining, with a series of air-induction and combustion flues arranged beneath a boiler, evaporator, or like article, a series of gas-flues, and a producer, the several flues relatively arranged to each other, so that the ignition and combustion of the gas shall heat the flues through which the air and gas are introduced, and in details of construction hereinafter more specifically set forth.

I will now proceed to describe my invention, so that others skilled in the art to which it appertains may apply the same.

In the drawing, A indicates a gas-producer, having a suitable grate, *a*, spy-hole a^1, and hopper a^2. The hopper a^2 is a vertical cylinder, closed above by a cap or cover, a^3, and below by a conical or bell valve, a^4. The diameter of the base of the cone-valve is greater than the diameter of the charging-cylinder, so that the valve fits up against a flare at the base of the cylinder, and must be lowered to introduce the fuel. Such a valve will act as a deflector to spread the fuel. The valve a^4 is secured by a chain to the weighted lever a^5. a^6 indicates a flue, which conducts the gas from the producer A to a point beneath the boiler or evaporator B. This flue is guarded by a suitable valve, a^7, and terminates in or is split up into a series of gas-flues, *g g g*, (the number dependent on the size of the furnace,) arranged beneath the boiler. h^1 h^1 indicate a series of induction and return air-flues, arranged beneath the gas-flues *g*, and parallel therewith, said air-flues being guarded by doors or valves *i*, by means of which the quantity of air admitted can be regulated. The gas-flues *g* and the air-flues *h* unite at a point, *k*, and there communicate with the combustion-chamber *b*, and a series of vertical combustion-flues, b^1, arranged between the several sets of gas and air flues. The vertical combustion-flues b^1 connect with the main combustion-flue *b*, and the junction of the several flues may be guarded by a series of brick or tiles, if desired. B indicates a boiler, C the brick-work and casing, and D the usual stack-pipe, said devices forming no part of the invention, and therefore requiring no specific description. For such devices an evaporating-pan or like utensil may be substituted, according to circumstances.

In so far as above described, and when employed with generated gases, the flues may be built of brick; but when using natural gas it has thus far been found almost impossible, at least without adding greatly to the cost of construction, to make brick flues sufficiently tight to prevent the leakage of gas. I therefore, when natural gas is to be used regularly or incidentally, form the gas-flues, and, if desired, the air-flues also, of iron or fire-clay pipes, (see g' h^2 h^3, Fig. 4,) building the said pipes into the furnace, in the location of and as substitutes for the flues before specified. The gas-pipe thus built in may be connected directly to the natural-gas-supply pipe, a suitable valve being arranged in the supply-pipe, so as to shut off, limit, or control the admission of gas to the furnace.

The rear of the combustion-chamber *b* and the gas-flue a^7 are connected by a flue, b^2, provided with a damper, b^3, so that when the gas-flues *g* or pipes become clogged by deposits of carbon, the ignited gases or flame may be caused to pass through them, so as to burn out the deposit.

The operation of these devices is as follows: Gas from the producer (or natural gas admitted as before specified) enters flue *a*, and is conducted through gas-flues *g* to the point *k*, where it mingles with a regulated quantity of air, which has entered the furnace through air induction and return flues *h* h^1. The combustion takes place in the chambers *b b* beneath the boiler. As the chambers *b b* surround the flues *g h* h^1, the incoming gas and air will be heated by the burning of the fuel, and not by the waste products, as in regenerator-furnaces. In charging the producer by means of the bell-hopper valve, the valve, being lowered to admit the charge, becomes a deflector, which spreads and equally distributes the charge.

Among the advantages of my invention are simplicity of construction and the uniformity with which the gas and air are heated, the gas and air flues being located within the combustion-chamber.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a boiler or similar furnace, the combination of the series of air and gas induction flues with the combustion-flues *b* b^1, arranged above and between the same, substantially as and for the purpose specified.

2. The combination of the boiler or similar furnace, composed of the series of air and gas induction flues *g h* and the combustion chamber or flues *b b*, with the gas-producer A, substantially as and for the purpose specified.

3. In a boiler or similar furnace, the combination of the induction gas-flue, the combustion-chamber, and the connecting-pipe b^2, provided with a suitable valve, substantially as and for the purpose set forth.

4. The combination of the charging cylinder or hopper, flared at its base, and the bell or conical drop-valve, substantially as and for the purpose set forth.

In testimony whereof I, the said WILLIAM SWINDELL, have hereunto set my hand.

WILLIAM SWINDELL.

Witnesses:
JAMES I. KAY,
F. W. RITTER, Jr.