(No Model.)

S. P. HUTCHINSON & S. L. WIEGAND.

STEAM FURNACE.

No. 570,999. Patented Nov. 10, 1896.

Fig. 1.

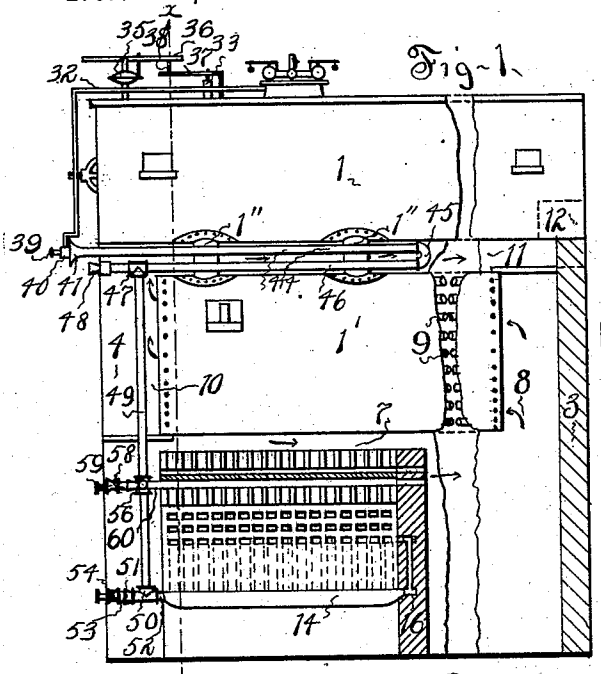


Fig. 5.

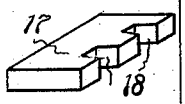


Fig. 6.

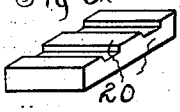


Fig. 7.

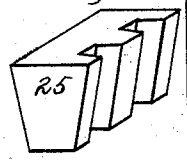


Fig. 2.

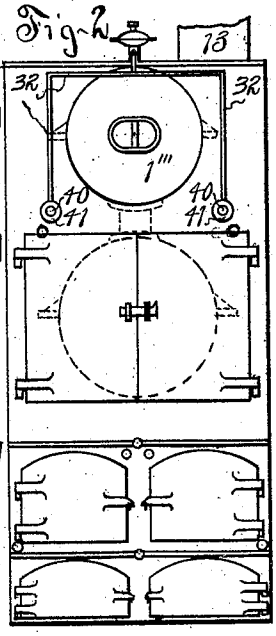


Fig. 3.

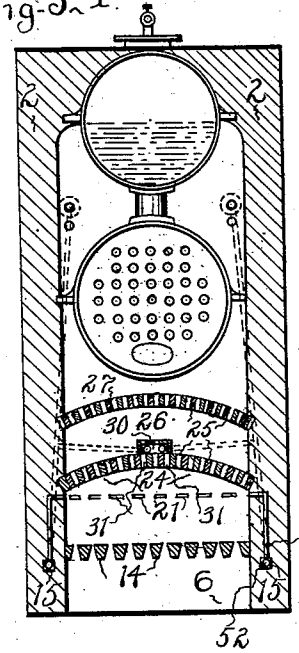


Fig. 4.

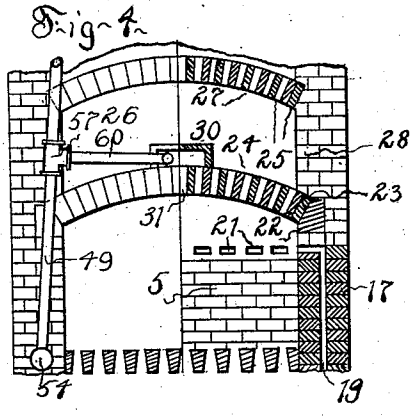


Fig. 8.

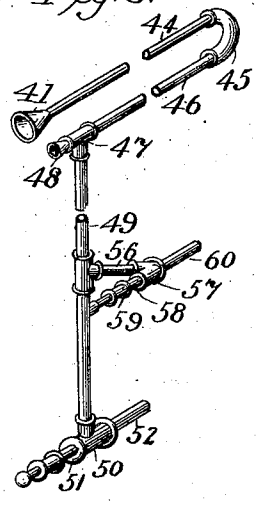


Fig. 9.

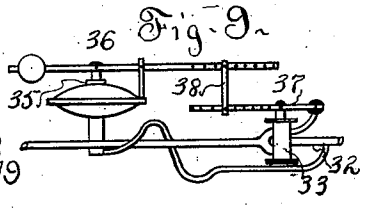
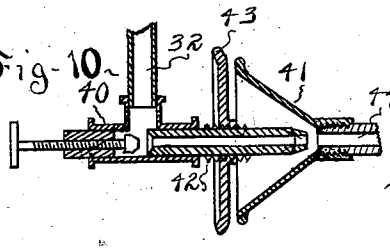


Fig. 10.



WITNESSES:

J. Daniel Eby

Lacey & Lacey

INVENTORS:

S. P. Hutchinson

S. L. Wiegand

UNITED STATES PATENT OFFICE.

SAMUEL PAXSON HUTCHINSON AND S. LLOYD WIEGAND, OF PHILADELPHIA, PENNSYLVANIA; SAID WIEGAND ASSIGNOR TO SAID HUTCHINSON.

STEAM-FURNACE.

SPECIFICATION forming part of Letters Patent No. 570,999, dated November 10, 1896.

Application filed September 18, 1894. Renewed August 31, 1896. Serial No. 604,463. (No model.)

To all whom it may concern:

Be it known that we, SAMUEL PAXSON HUTCHINSON and S. LLOYD WIEGAND, citizens of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Steam-Furnaces; and we do hereby declare the following to be a sufficiently full, clear, and exact description thereof as to enable others skilled in the art to make and use the said invention.

This invention relates to furnaces for generating steam in boilers, and relates particularly to that class of furnaces in which steam and air are introduced in heated condition to the gaseous fuel evolved from the coal or like solid fuel, and has for its object the better economy of fuel.

The invention consists in the method of introducing an air and steam supply and in a construction of furnace of easy and efficient adaptation to steam-boilers and in operation resembling in some features the invention set forth in United Letters Patent No. 492,020, dated February 21, 1893, to Samuel P. Hutchinson, one of the subscribers to this specification.

The construction and operation of this invention are hereinafter fully described, and shown in the accompanying drawings, in which—

Figure 1 shows a steam-boiler in partial sectional side elevation shortened in length and with a furnace embodying this invention applied thereto. Fig. 2 is an elevation of the same. Fig. 3 is a vertical section in the plane indicated by the dotted line *x x* in Fig. 1. Fig. 4 is an enlarged partial section of the furnace, showing the conduits for introducing and distributing steam and air. Figs. 5, 6, and 7 show in enlarged perspective view the bricks of which the channeled furnace-walls and perforated arches are constructed. Fig. 8 shows in detached perspective view the pipes for injecting and heating air and steam to one-half of the furnace. Fig. 9 shows in section the device for controlling the admission of air and steam to the heating apparatus, and Fig. 10 shows in enlarged section the construction of the fitting for controlling the distribution of air and steam to different parts of the furnace.

Referring to the drawings, 1 represents the boiler, which is of the type known as "rider" or "double deck," the lower cylinder 1′, of which has flues 9 extending through its entire length and is connected by necks 1″ to the upper cylinder 1‴, in which the working water-level is about in the plane of its axis.

2 2 are the side walls of the setting; 3, the rear wall thereof.

4 is the front wall or breast.

5 is the bridge-wall.

6 is the ash-pit.

7 is the flue under the cylinder 1′.

8 is the rear flue leading from the flue 7 to the flues 9 in the cylinder 1′.

10 is the front rising-flue leading from the front ends of the flues 9 to the returning-flue 11 between the cylinder 1′ and 1″, which leads to the flue 12, discharging the products of combustion into the chimney 13.

14 is the grate.

The parts above described are those in common use, and are here particularly referred to for facilitating the description of the novel parts combined therewith.

Below the level of the grate 14 there is formed a channel or conduit 15 in the side walls 2, which may be extended into a connecting cross-channel 16 at the same level below the bridge-wall 5. The upper side of the channels 15 and 16 is covered by grooved refractory bricks 17, (shown in enlarged view in Fig. 5,) so laid in courses that the grooves 18 form vertical channels 19, extending above the fuel and covered by grooved bricks 20, (shown in Fig. 6,) so laid that the grooves or channels 21 lead outwardly from the channels 19 into the furnace-chamber.

The channels or grooves 21 are covered by bricks or tiles 22, which have beveled upper surfaces 23, on which rests a perforated arch 24, formed of grooved bricks 25. (Shown in Fig. 7.) Above the perforated arch 24 is a chamber 26, and above this is a second perforated arch 27, formed of bricks 25, similar to those in the arch 24. The rear wall 28 of the chamber 26 is formed with perforations 29 in it made from bricks 20. (Shown in Fig. 6.)

The bridge-wall 5 is built up solidly above the openings 21 to the top of the arch 24, forming the rear wall of the furnace-chamber.

In the chamber 26 is formed a channel 30, with walls and top of refractory material, resting upon the arch 24, open at the front end and to the apertures 31 beneath it in the arch 24, but closed at the rear end.

A steam-pipe 32 leads from the upper part of the boiler 1 and is provided with a valve 33 and controlled by a pressure-regulator 35, connected therewith by levers 36 and 37 and a link 38, which is adjustable in position on the levers 37 and 36, so that the ratio of opening and closing of the valve 33, as actuated by fluid-pressure in the regulator 35, can be varied.

The pipe 32 extends forward from the valve 33 and is branched to each side, terminating in stop-valves 39 and jet-tubes 40. The jet-tubes 40 are placed centrally in front of air-funnels 41, so that steam-jets from the tubes 40 inject air into the funnels 41. On each of the jet-tubes 40 is a screw-thread 42, on which is fitted a screw-threaded disk or stopper 43, which by screwing upon the jet-tube furnishes means of regulating the admission of air to the funnels 41.

From the neck of the funnels 41 tubes 44 extend into the flue 11 and are connected by return-bends 45 with pipes 46, which extend to a three-branched fitting or T 47, the front opening of which extends through the breast-wall 4 and is closed by a plug 48. From the side branch of the T 47 a pipe 49, located in the breast-wall 4, extends downward to a T-fitting 50, having the front branch closed by a plug 51 and the rear branch connected by a pipe 52 to the channel 15.

Through the plug 51 are fitted stems 53, bearing valves 54, by which the flow of air from the T-fittings 50 to the pipes 52 and channels 15 and 16 is adjusted.

In the pipe 49 is a branch or T fitting 55, from the side branch of which a pipe 56 extends in the breast-wall 4 to a T-fitting 57, the front end of which is plugged and provided with a stem 58 and valve 59, and the rear end is connected by a pipe 60 with the channel 30 in the chamber 24. By means of the stem 58 and valve 59 the flow of air and steam to the chamber 30 (and thence to the center of the furnace through the openings 31) is adjusted and controlled.

In operating this furnace the fuel is kindled in the usual manner, and when steam has been raised in the boiler and the arch 24 highly heated a small amount of steam is injected from the jet-tubes into the air-funnels 41 and the disks 43 adjusted to limit the volume of air injected, so that the air with the steam flowing through the pipes 44, 46, 49, 52, and 56 and 60, with the channels 15 and 16, will not injuriously reduce the temperature of the tiles or brick 17, 20, and 25, and enters the furnace-chamber at such temperature as to combine with the carbon of the fuel and form increased volumes of combustible gas, and burns such gas with the best calorific effect.

The draft of the flue 12 may be regulated in the usual manner by a connected regulator independently of the regulator controlling the steam and air injectors.

The effective operation of this invention results from highly superheating the steam and air injected into the combustion-chamber above the fuel prior to bringing it into contact with the heating-conduits formed in the walls and arch of the furnace and injecting the air and steam in the center, as well as at the side of the furnace, in which the solid fuel is protected from undue loss of heat by radiation by means of the system of perforated arches.

Having described our invention, what we claim is—

1. In a steam-boiler furnace, a fuel-chamber having walls of refractory material, containing air-inlets connected with a heated air steam supply, a perforated arch covering said fuel-chamber, a second chamber above said fuel-chamber, also covered by a perforated arch, in combination with a central conduit in said second chamber arranged to discharge previously-heated steam and air into the central portion of the fuel-chamber as set forth and described.

2. In a steam-boiler furnace, the combination of steam-jets, an automatically-regulated steam supply connected therewith, air-inlet funnels provided with air-flow-regulating disks tubes and return-bends, and pipes located in the flue of a connected boiler-furnace, pipes protected from radiation in the breast of the furnace, connecting said tubes and return-bends with the channels for distributing heated air and steam in the furnace, and valves arranged to adjust the relative flow of heated steam and air to different parts of said furnace substantially as set forth.

SAMUEL PAXSON HUTCHINSON.
S. LLOYD WIEGAND.

Witnesses:
J. DANIEL EBY,
LACEY L. CADWALLADER.