(No Model.)

G. L. CROSS.

SMOKE CONSUMING FURNACE.

No. 487,823. Patented Dec. 13, 1892.

Fig. 1.

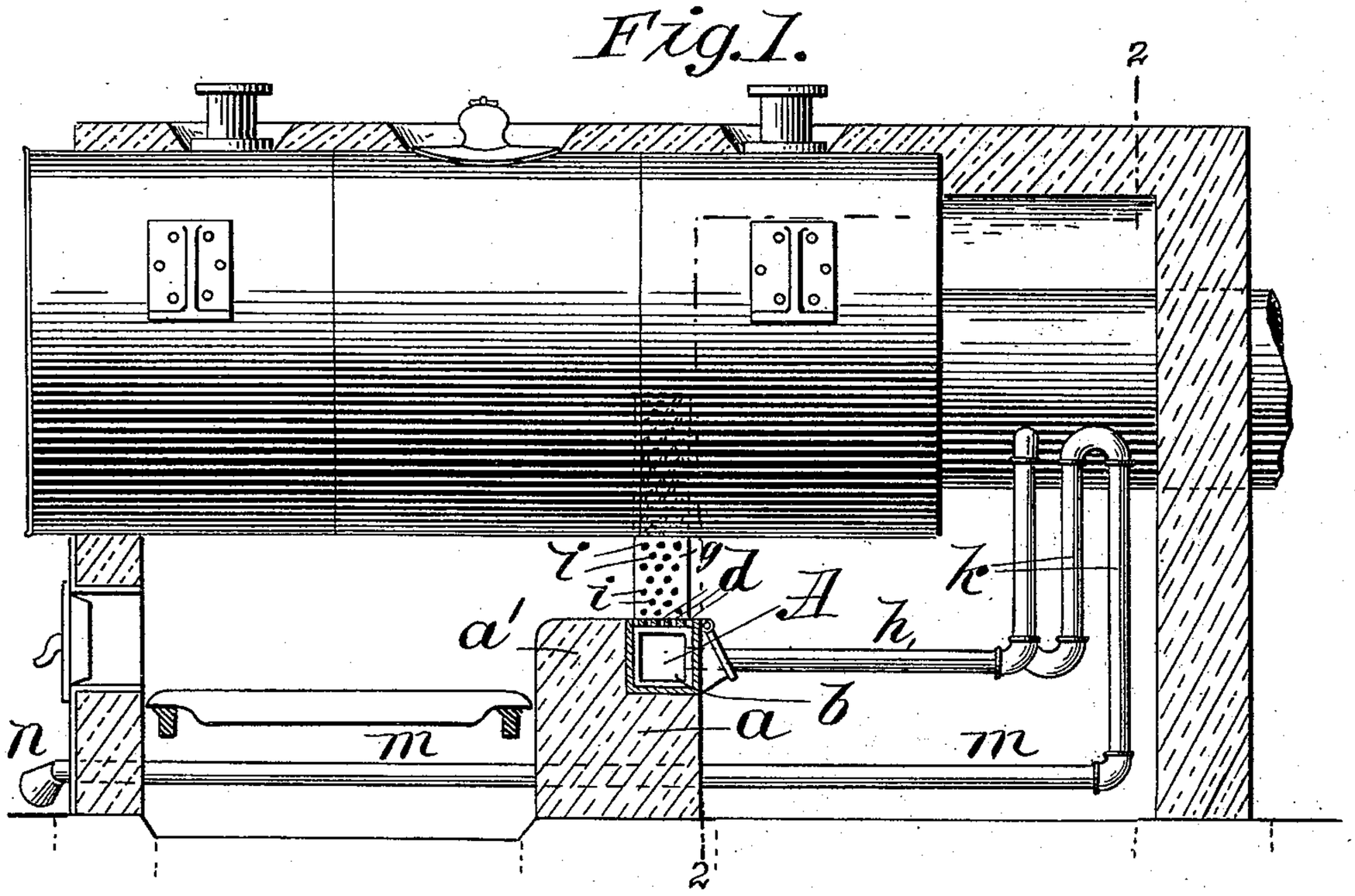


Fig. 2.

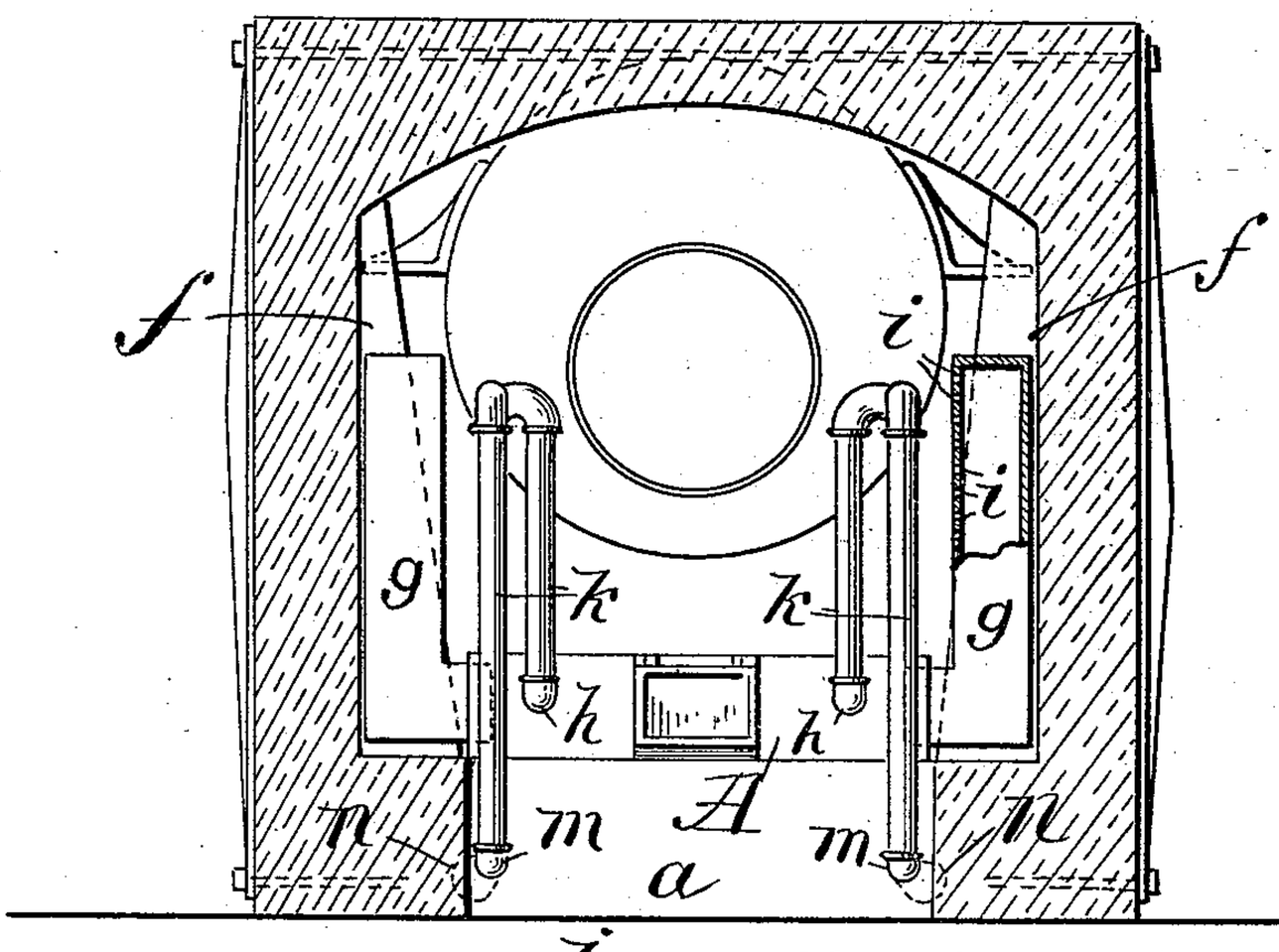
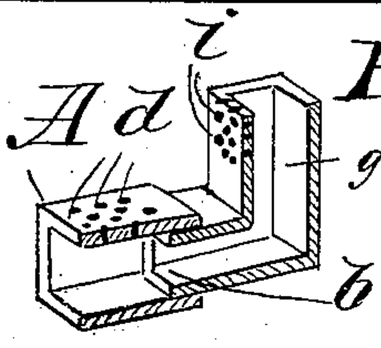


Fig. 3.



Witnesses:
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Inventor:
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UNITED STATES PATENT OFFICE.

GEROME L. CROSS, OF SPRINGFIELD, MASSACHUSETTS, ASSIGNOR OF TWO-THIRDS TO DANIEL W. MELLEN AND WILLIAM D. McKENZIE, OF SAME PLACE.

SMOKE-CONSUMING FURNACE.

SPECIFICATION forming part of Letters Patent No. 487,823, dated December 13, 1892.

Application filed January 7, 1892. Serial No. 417,318. (No model.)

To all whom it may concern:

Be it known that I, GEROME L. CROSS, a citizen of the United States, residing at Springfield, in the county of Hampden and State of Massachusetts, have invented new and useful Improvements in Smoke-Consuming Furnaces, of which the following is a specification.

This invention relates to improvements in smoke-consuming furnaces of the character set forth in the Letters Patent of the United States granted to Geiger, McKenzie, and Cross June 9, 1891, No. 453,805.

The purpose of the invention is to render the smoke-consuming furnace more efficient for the economical production of a desired degree and volume of heat from a given quantity of coal than heretofore and by means of an apparatus which is most simple and comparatively inexpensive of construction and easy of application relative to furnaces which may be already set.

The invention to these ends consists in constructions and arrangements or combinations of parts, all substantially as will hereinafter fully appear, and be set forth in the claims.

Reference is to be had to the accompanying drawings, in which—

Figure 1 is a longitudinal section from front to rear of a boiler-furnace, showing the present improvements applied with relation thereto. Fig. 2 is an elevation taken at right angles to Fig. 1 of the improved apparatus, the masonry of the furnace being shown as in cross-section on the plane indicated by the line 2 2, Fig. 1. Fig. 3 is a perspective and sectional view showing the manner of connection of the air-conduit receptacles.

The present improved apparatus embodies, as in the aforementioned Letters Patent, the bridge-wall *a*, of step form, with the rising portion *a'* forward of the horizontal portion, on which the cast-iron box A is placed. The said box extends nearly or quite across the furnace-chamber and is closed with the exception of a series of perforations *d d* through its top and apertures *b* at its end walls. The masonry at the sides of the furnace-wall is at and above the ends of the horizontal box built with vertical recesses *f f*, in which are located as to part or all of the thickness thereof pipes *g*, which at their lower ends are provided with elbow-sections *h*, which are connected with the horizontal box at the apertured ends of the latter. Each of said pipes, as shown, is cast rectangular in cross-section with the elbow-section integral therewith, said portion being open at its end and adapted to enter the aperture in the end of the box to be in full communication with the box-chamber, while the upper ends of the said vertical pipes are closed either by an integrally-cast closing-wall or by an independent stopper-section. The inner wall of each of the vertical pipes which stand just within the combustion-chamber has the series of perforations, as indicated at *i i*.

m m represent the air-pipes passing rearwardly from the front of the furnace through the ash-pit and under the bridge-wall and then upwardly into the combustion-chamber at the rear of the bridge-wall, continued and disposed in return-bent sections or coils *k*, and thence forwardly extended to communication with the said box near the ends thereof. The said pipes at their ends at the front of the furnace are provided with funnels *n n*, outwardly flaring. The axes of these funnels are angular to the pipes, and the funnels are also adjustable on the pipes, whereby they may be turned with their mouths away from the greatest air currents or drafts in the boiler-room or toward them. The air entered at the funnel-mouths of the pipes and passing to and continued in the coils or return-bent sections in the combustion-chamber there becomes highly heated and is thence delivered into the horizontal box to issue in part through the perforations in the top thereof and in part to pass into and ascend the upright pipes and thence to issue laterally into the furnace-chamber above the bridge-wall.

While it is advantageous in a degree to have the air-jets rising from the box, the desirable effects are very materially augmented by the transverse air-draft from the upright pipes at different heights, the one hot-air supply acting as an auxiliary with the other for the establishment and protracted maintenance of the desired high degree of heat of

the air at the bridge-wall for effecting the most perfect combustion of the fuel elements.

The provision of the horizontal cast-iron box having the apertures in its end walls, as described, and the vertical pipes with the horizontal elbows render the application of the novel contrivances in furnaces most easy, for with a given width of box the fittings may be applied in furnaces of somewhat-varying widths, because the elbow-sections may be set farther within the end apertures of the box than in wider furnaces, there being practically a sliding engagement at the connection between the box and the vertical pipes.

It is preferred to set the vertical pipe within recesses at the side walls of the furnace for the purpose of materially shielding the pipes from the destructive action of the often-saturated flame at the grate.

A highly scientific and impartial demonstration made by a leading expert by means of evaporation tests, using the apparatus for consuming and preventing smoke, constructed as hereinbefore described, and set up in a large steam-power plant, resulted in a showing of economy of fuel amounting to eight and three-tenths per cent. and a noticeable increase in capacity over the showing made when the air was excluded from entrance to the air-pipe.

The effect of the appliance upon the combustion as viewed by an observer watching the smoke and flame behind the bridge-wall was to produce marked advantage, most especially at the time of adding new coal. After the air-pipes had been closed up the then introduction of air was immediately followed by a brightening up in the combustion-chamber and the appearance of clear flame, while the cutting off of the air obscured the flame and rendered the chamber dark and cloudy. The very satisfactory degree of the advantageous result derived is in consequence of the action of the vertical hot-air jets from the box in conjunction with the transverse hot-air jets at different heights from the upright pipes.

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

1. In a smoke-consuming furnace, the combination, with the bridge-wall having a support at its rear upper portion, of a metallic box mounted upon said support and having a series of perforations through its top, upright metallic conduits at the sides of the furnace-chamber, having at their lower ends free communication with the chamber of said box and having series of perforations through the inwardly-facing walls, and an air-supply pipe leading from outside of the furnace and having sections thereof disposed in the combustion-chamber and entering the chamber of said box, all whereby the highly-heated air from said pipes may in part issue from the top of the box and in part continue through the ends of the box and upwardly in said side conduits to simultaneously issue at the sides of the furnace, substantially as and for the purpose set forth.

2. In a smoke-consuming furnace, the combination, with the bridge-wall having a support at its rear upper portion and its side walls opposite said support vertically recessed, of a metallic box mounted upon said support and having a series of perforations through its top, upright metallic conduits set in said recesses at the sides of the furnace-chamber and having at their lower ends free communication with the chamber of said box and having series of perforations through the inwardly-facing walls, and an air-supply pipe leading from outside of the furnace and having sections thereof disposed in the combustion-chamber and entering the chamber of said box, all substantially as described and shown, for the purposes set forth.

3. In a smoke-consuming furnace, the combination, with the metal box set at the bridge-wall, having a series of perforations through its top and apertures through its end walls, of the upright pipes set at the sides of the furnace, with perforations through their inwardly-faced walls and having the angular members at their lower ends for an adjustable fit and engagement in said end apertures of the box, and the supply-pipes which lead from the outside of the furnace and have portions thereof in the combustion-chamber and thence extended to communication with the box-chamber, substantially as described.

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