

N. FROST.
FURNACE.

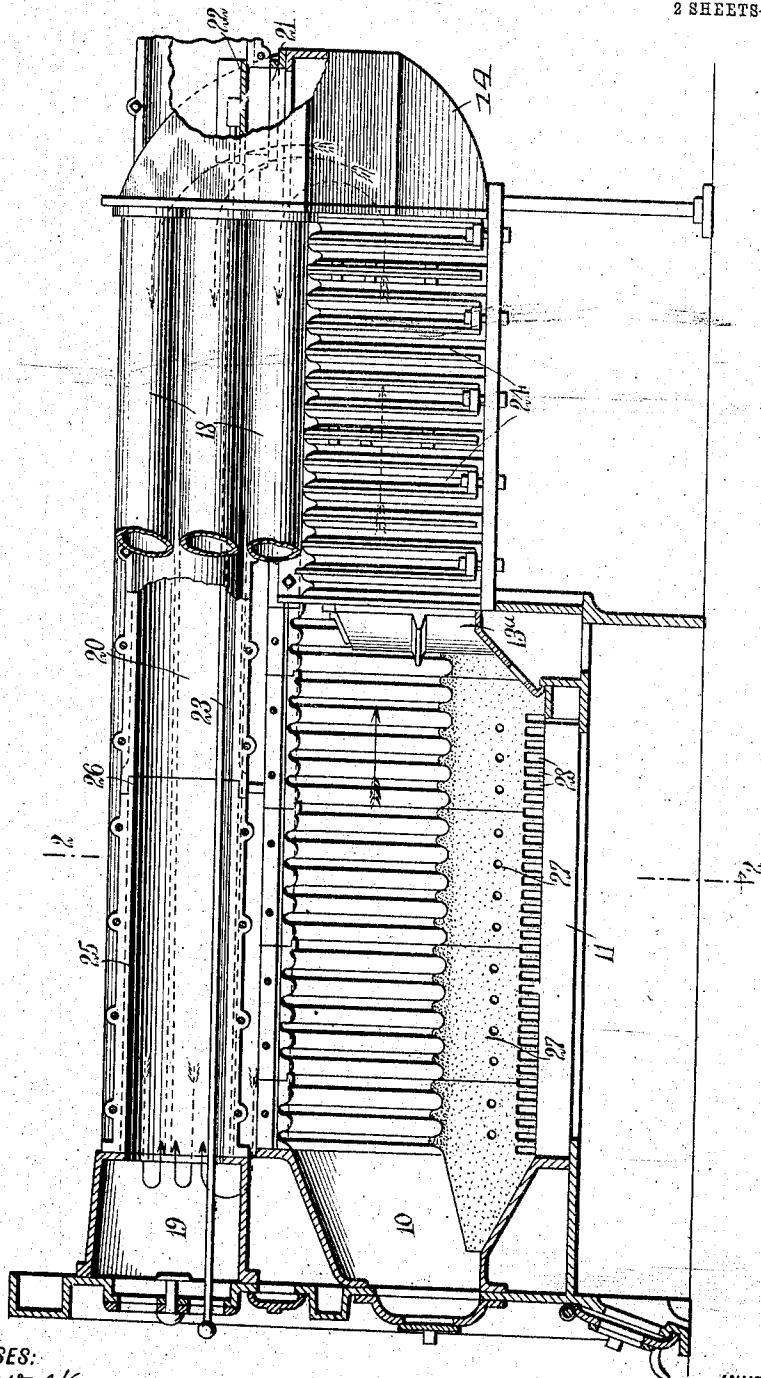
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1,018,967.

Patented Feb. 27, 1912.

2 SHEETS—SHEET 1.

Fig. 1.



WITNESSES:

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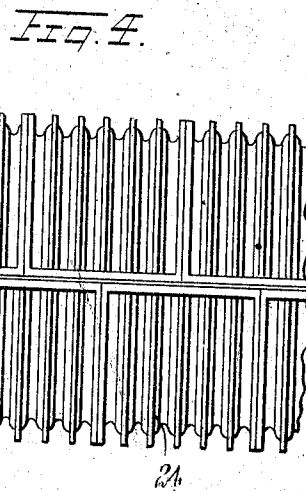
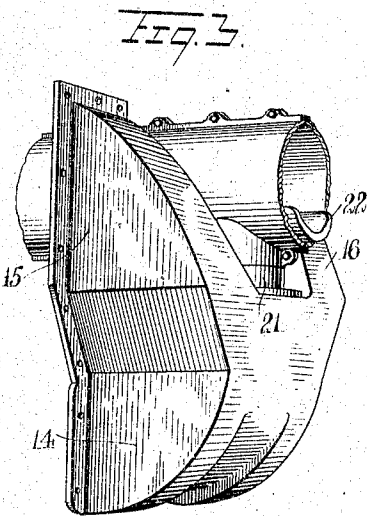
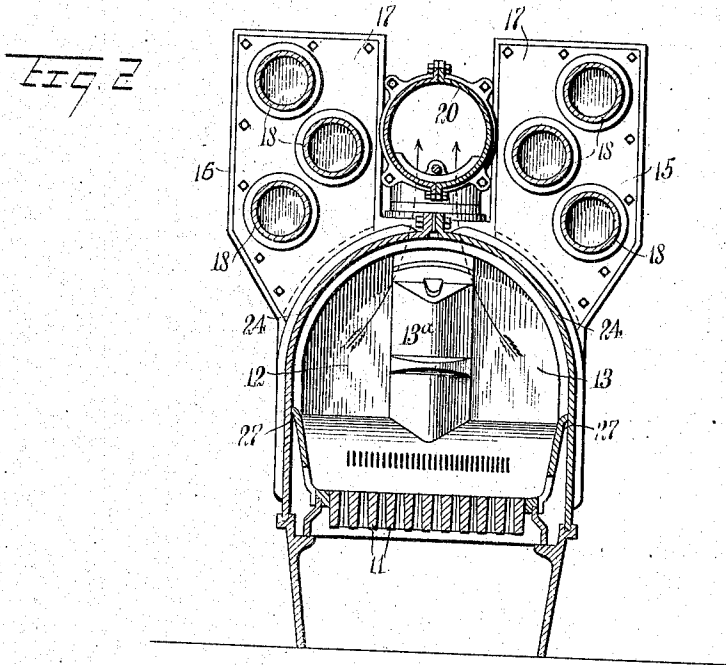
M. J. M. Co.

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UNITED STATES PATENT OFFICE.

NATHANIEL FROST, OF BLOOMINGTON, ILLINOIS.

FURNACE.

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Specification of Letters Patent.

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Application filed November 10, 1910. Serial No. 591,566.

To all whom it may concern:

Be it known that I, NATHANIEL FROST, a citizen of the United States, and a resident of Bloomington, in the county of McLean and State of Illinois, have invented a new and Improved Furnace, of which the following is a full, clear, and exact description.

My invention relates to certain improvements in furnaces for use in heating air, and relates more particularly to that type of furnace in which the air is exhausted to flow backwardly and forwardly through conduits or passageways before being delivered to the smoke stack.

In one type of horizontal furnace there has been employed a fire box with a rearward extension presenting corrugated sides and terminating in a back breeching. From the upper end of this breeching a plurality of conduits extend forwardly over the fire box and at a point above the forward end of the latter to connect with a rearwardly-extending, horizontally-disposed smoke pipe. Within these parts is a casing through which passes the air to be heated.

One object of my invention is to increase the heating effect upon air at the time the dampers are open to give the fire a direct draft.

Another object of my invention is to provide certain improvements in the smoke pipe, whereby greater life and more efficient service will be secured therefrom.

The other objects and advantages of my improved construction will be more fully set forth hereinafter and pointed out in the claim.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views, and in which—

Figure 1 is a side elevation of a furnace, constructed in accordance with my invention, a portion thereof being broken away to show the interiors of the fire box and smoke pipe; Fig. 2 is a transverse section on the line 2—2 of Fig. 1; Fig. 3 is a perspective view of the back breeching; and Fig. 4 is a top plan view of a portion of the fire box.

In the specific hot air furnace illustrated in the accompanying drawings there is provided a fire box 10 having grate bars 11 and two separate rearward extensions 12 and 13 from this fire box, the two extensions con-

stituting conduits and separated by a partition 13^a. At their rear ends these partitions connect to a one-piece back breeching 14, illustrated in perspective in Fig. 3. This back breeching has an outwardly-extending flange by which it is bolted to the rear end of the fire box extension passages 12 and 13, and has two upwardly-extending branches 15 and 16 connected with the two passages 12 and 13, respectively. These branches at their upper ends each has a front wall 17, apertured for communication with separate forwardly-extending conduits 18. In the specific form illustrated there are employed three of these conduits upon each side, although the particular number is not important. At their front ends all of these conduits 18 connect to a transversely-extending chamber 19 disposed above the front end of the fire box. This chamber has a large central aperture by which it communicates with a smoke pipe 20 extending rearwardly between the separate sets of conduits. Broadly speaking, these parts and their relative arrangement are old in the art.

I have illustrated an arrangement of parts, whereby the smoke and gases of combustion flowing rearwardly from the fire box through the passages 12 and 13 may enter the smoke pipe adjacent the rear end of the furnace to establish a direct draft without passing through the conduits 18 and the horizontal section 20 and the portion of the smoke pipe therebetween. In furnaces of this character it has been common to establish a direct draft communication between the front end of the fire box and the chamber 19 directly thereabove. The flames and hot gases do not flow through the passages 12 and 13 or along the sides of the fire box, instead they come directly forward and into the smoke pipe, so that there is very little heat effect upon the air within the casing inclosing the furnace. In my improved construction, I provide a back breeching with a central passage 21 between the two branches 15 and 16 and in communication with both the passages 12 and 13. This central passage 21 communicates with the smoke pipe at a point between the two branches 15 and 16 of the breeching, and within the smoke pipe is a damper 22 for controlling communication.

The damper 22 may be operated in any suitable manner, but, as illustrated, it is of curved form to fit the lower surface of the

smoke pipe and is connected to a rod 23 extending forwardly through the smoke pipe of the chamber 19 to the front end of the furnace, as is illustrated in Fig. 1.

5 Upon opening the direct draft in my improved furnace to temporarily increase the rate of combustion the damper 22 is pulled forwardly to open the passage 21, and the flames may then flow from the fire box rearwardly through the passages 12 and 13 to the passage 21 and then into the smoke pipe. In doing so the flames and gases are caused to travel over the corrugated sides of the fire box and of the passages 12 and 13 so that the latter are heated and radiate the heat to the surrounding air. The draft is direct, but at the same time the most important element of the radiating surface is in operation. When it is desired to cut out the direct draft the passage 21 is closed and the gases flow rearwardly through the passages 12 and 13, then forwardly through the conduits 18 and then rearwardly again through the smoke pipe 20 to obtain from the hot gases the maximum amount of heat.

Further illustration involves the construction of the side walls of the fire box and of the passages 12 and 13. This wall is substantially semicylindrical in form and is made up of a plurality of separate corrugated cast iron sections 24. These sections substantially meet along the top and are provided with flanges by which the sections on each side are bolted at the ridge to those on the opposite side. Preferably I so form these sections that the joints between the sections on one side are not in alinement with the joints in the sections on the opposite side. Thus each section on one side is bolted to two separate sections upon the opposite side, as is clearly indicated in Fig. 4. This increases the strength and rigidity of the furnace and prevents the joints from breaking or being separated due to the expansion and contraction undergone during the temperature changes.

Instead of forming the smoke pipe of sheet metal, as is customary in furnaces of this character, I form it of semi-cylindrical cast iron sections 25 rigidly bolted together and provided with a joint 26, as indicated in Fig. 1, to provide for the expansion and

contraction of the parts. The flanges which hold the sections together constitute radiating fins to facilitate the heating of the air in the outside casing, and the cast iron having a comparatively high thermal capacity gives a more even distribution of the heat to the air.

In the fire box I, I may also provide a plurality of side lining sections 27 of fire clay or other suitable refractory material, and so construct the sections that they fit into the lower portion of the corrugations of the side walls of the fire box and also extend outwardly horizontally toward the grate bars. These lining sections are provided with slots 28 or apertures which lead through to the space beneath the grates so that the lining pieces constitute a portion of the horizontal supporting surface of the fire bed and increase the effective area of the grates and promote combustion.

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

A furnace having a firebox and having its rear portion divided to form passages, a one-piece hollow back breeching communicating at its lower portion with said passages and bifurcated to form upwardly-extending spaced branches and a portion between the lower ends of the branches, constituting a saddle and having an opening communicating with the interior of the breeching, a hollow front breeching, conduits extending from said branches of said back breeching to the side portions of the front breeching, a smoke pipe normally open to the front breeching and extending rearwardly therefrom between the said branches of the back breeching, said smoke pipe having an opening coinciding with the said saddle opening, and a damper controlling direct communication of the back breeching and said smoke pipe.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

NATHANIEL FROST.

Witnesses:

L. K. HEALY,
F. J. ROACH.