

(No Model.)

S. C. DAVIDSON.
SMOKE CONSUMING FURNACE.

No. 600,998.

Patented Mar. 22, 1898.

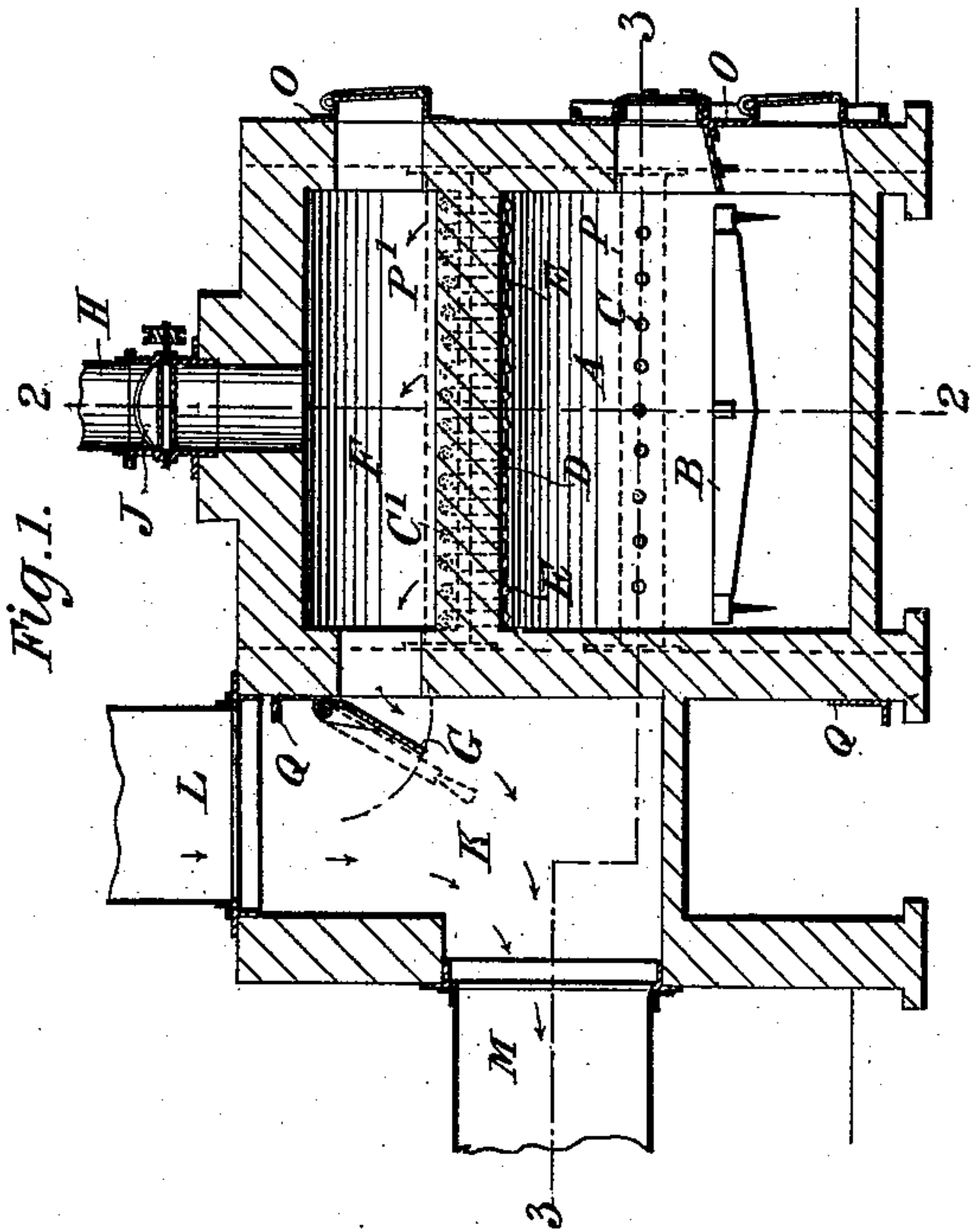
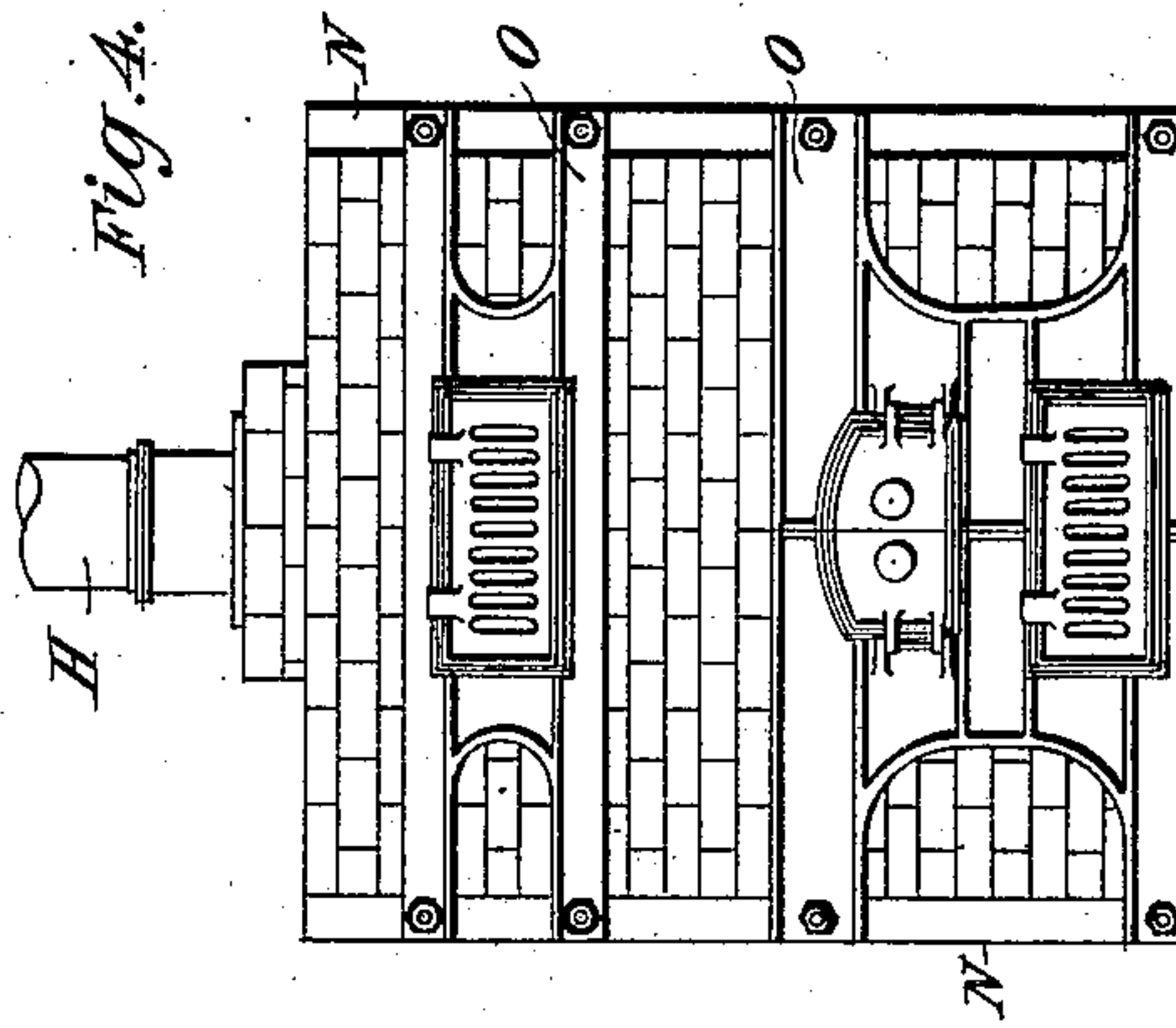
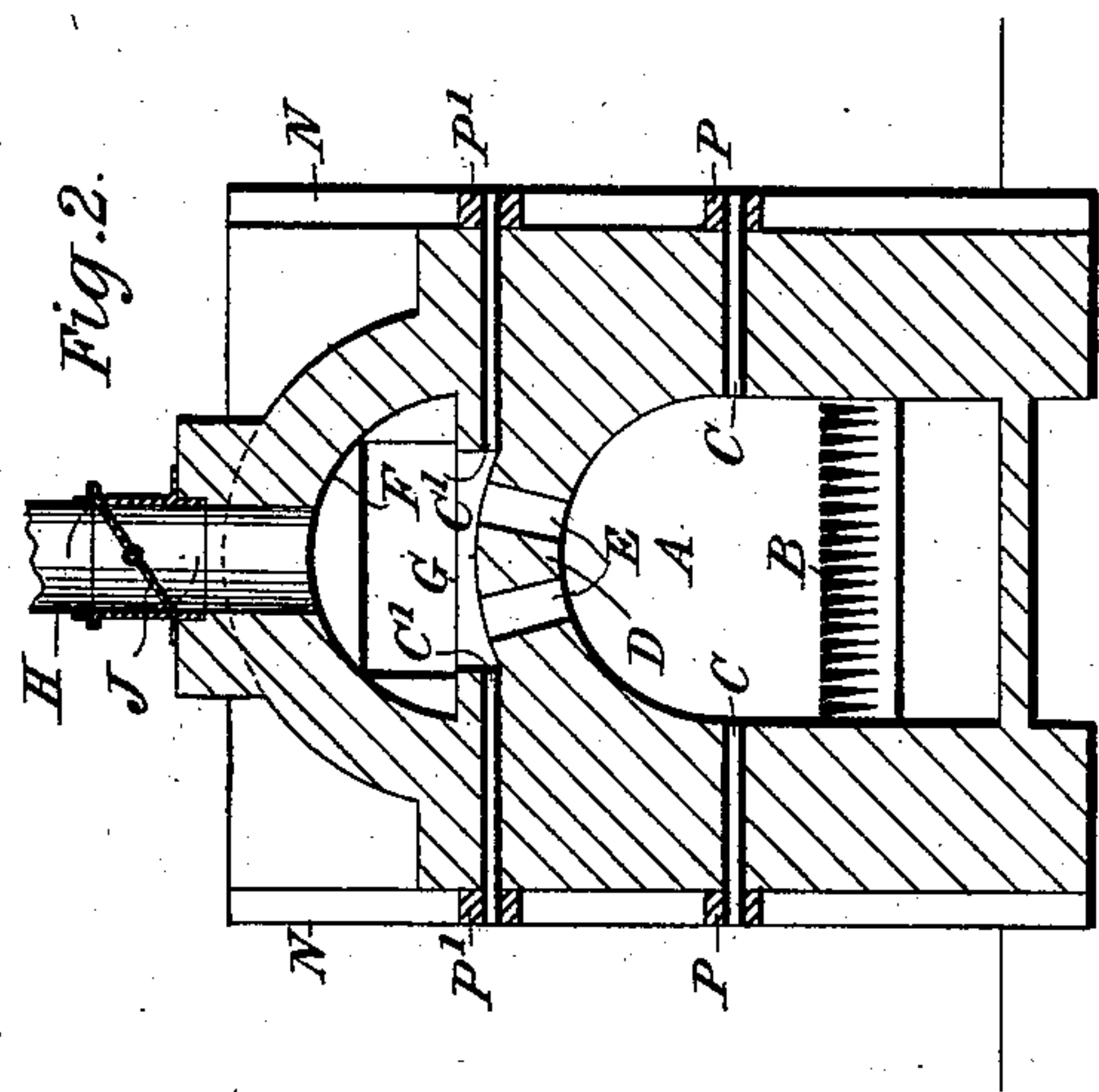
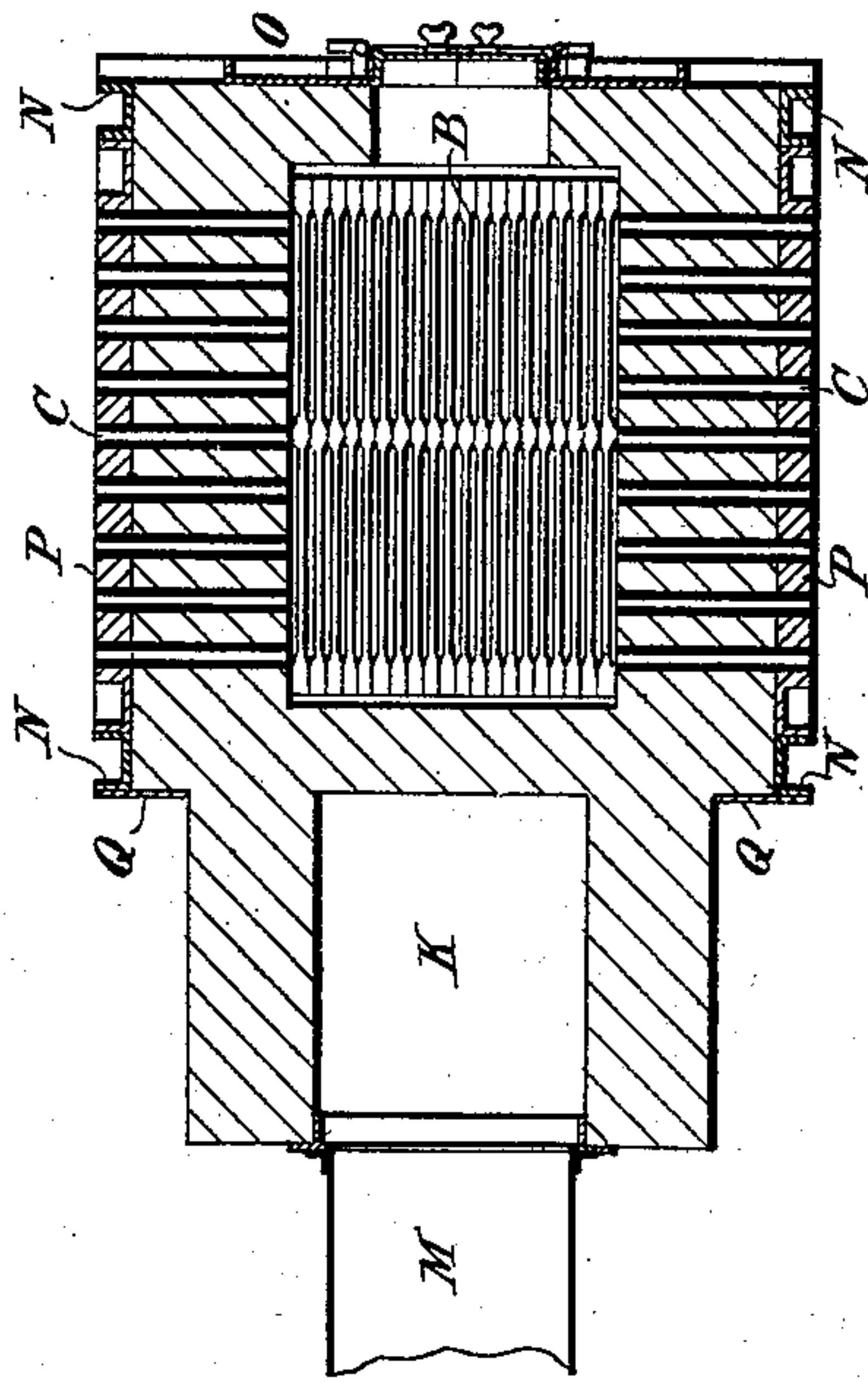


Fig. 3.



WITNESSES:

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UNITED STATES PATENT OFFICE.

SAMUEL C. DAVIDSON, OF BELFAST, IRELAND.

SMOKE-CONSUMING FURNACE.

SPECIFICATION forming part of Letters Patent No. 600,998, dated March 22, 1898.

Application filed December 8, 1896. Serial No. 614,873. (No model.) Patented in England June 1, 1895, No. 10,921; in Ceylon October 3, 1895, No. 480, and in India October 22, 1895, No. 205.

To all whom it may concern:

Be it known that I, SAMUEL CLELAND DAVIDSON, merchant, of Belfast, Ireland, have invented certain new and useful Improvements in Smoke-Consuming Furnaces for Air-Heating Stoves and for Boilers, (for which I have obtained patents in Great Britain, No. 10,921, bearing date June 1, 1895; in India, No. 205 of 1895, bearing date October 22, 1895, and in Ceylon, No. 480, bearing date October 3, 1895,) of which the following is a specification.

This invention has reference to smoke-consuming furnaces for air-heating stoves where- in the heating of the air is effected by admixture of the products of combustion from the furnace.

My invention provides certain improvements in furnaces, especially applicable to those for heating air for driers and other purposes, which will hereinafter be fully set forth.

The improvements in their preferred form consist in the construction of a brick-lined or brick-built furnace with a number of fresh-air-inlet jets or orifices along the sides of the fire, the said inlets consisting of metal tubes attached to part of the metal framework inclosing the brickwork and so arranged that the air is delivered in jets at about four or five inches above and across the surface of the fuel burning therein, whereby this air gets thoroughly mixed with the unconsumed hot gases arising from the fire, and as the air thus admitted is considerably heated in passing through these tubes, which from their position get very hot, it readily combines with the said gases and so completely effects their combustion that the smoke is very thoroughly consumed. The furnace is preferably arched over with fire-brick above the level of the air-inlet jets at the sides, and in the upper part or crown of this arch a sufficient number of hollow or perforated fire-bricks are so built in that the products of combustion can freely pass up through the same from the arched-over furnace to another preferably fire-brick-arched flue on the top of the same, through each side of which flue another series of air-inlet tubes or orifices are arranged to admit a further or second supply of fresh air from the

atmosphere in the form of jets, so as to thoroughly mix with the upflowing jets of products of combustion from the furnace below. As the partitional wall between the fire-furnace and the upper flue or chamber is of refractory material, the products of combustion in passing through the holes in said wall enter the upper flue without their temperature having become reduced, so that the heated fresh air which mixes with them ignites them. Complete combustion of any smoke which may still be imperfectly consumed will thus be so thoroughly effected that when the fire-gases subsequently pass from this upper flue they should be perfectly free from the presence of smoke. At the end of this upper flue is an adjustable door or slide-damper, which then admits them into a flue through which a separate supply of cold air is being drawn by a fan or other air-propelling device. The hot smokeless products of combustion on mixing therewith more or less heat up this air-current, according to the relative volume of hot gases admitted thereto through the adjustable door or valve in the top or second combustion-chamber of the furnace. On the top of this second or top combustion-chamber a chimney is constructed with a damper-valve in it, which is intended to let away the smoke from the furnace when the fire is being lighted up at the start and before the furnace has got sufficiently heated up to cause the gases of the fuel to ignite with the fresh-air-jets from the sides, as until this is the case more or less smoke accompanies the products of combustion; but when the sides and arched roof of the furnace and top flue have got sufficiently hot to promote the ignition of the gases the smoke is consumed so completely that the products of combustion are then practically free from smoke and are then suitable for admixture with air to raise its temperature for drying or other purposes where admixture of comparatively smokeless gases from the furnace having no detrimental effect on the material being dried or treated—such as in the case of the drying of grain, bricks, &c.

In the accompanying drawings, Figures 1 to 4 are views of a smoke-consuming furnace constructed according to my invention and

applicable to an air-heating stove, in which furnace the products of combustion are first supplied with jets of fresh air to effect combustion in the furnace and after passing from the furnace are further mixed with a second supply of fresh air to complete combustion and are then passed, together with a further supply of cold air by means of a fan or other air-propelling device, to the place where the mixture of heated air and products of combustion is to be utilized for drying or other purposes. Fig. 1 is a sectional elevation of the smoke-consuming furnace; Fig. 2, a cross-section taken through line 2 2 of Fig. 1; Fig. 3, a sectional plan taken through line 3 3 of Fig. 1, and Fig. 4 a front elevation of the furnace.

Referring to Figs. 1 to 4, A is the furnace or fireplace, and B the fire-bars.

C C are fresh-air-inlet metal tubes or orifices formed along the sides of and admitting fresh air into the furnace. These tubes C C are attached to the cross-bars P P, which are part of the metal framework inclosing the brickwork.

D is a fire-brick arch thrown across the furnace, in the crown of which are a number of holes or perforations E E to allow the products of combustion to pass freely through into an arched flue F, constructed with a damper G at one end. Through each side of this flue another series of air-inlet tubes or orifices C' is arranged to admit a further supply of fresh air to mix with the products of combustion. These tubes C' C', like the tubes C C, are attached to cross-bars P' P'.

H is a smoke-chimney mounted on the top of the flue F and constructed with a damper-valve J, which is intended to be kept open only during the lighting up of the fire to take away the smoke until the furnace gets sufficiently heated up to cause the fuel gases to ignite with the fresh-air jets, and the quantity of smoke is reduced to practically nothing. The valve J is then closed and the damper G opened. The products of combustion then pass into a flue K, through the inlet-opening L of which a separate supply of cold air is being passed to the outlet-opening M. This separate supply of cold air becomes mixed with the products of combustion and gets more or less heated up, according to the volume of hot gases admitted through the damper G. The heated current of air and products of combustion then pass through the opening M to the material to be dried. The arrows indicate the flow of the current of cold air and the products of combustion from the furnace.

N N are pillars or upright columns, to which are bolted the front plates O O of the furnace, the cross-bars P P P' P' carrying the air-inlet tubes C C and C' C'. The end bars Q Q are also bolted to the pillars N N, thus forming a complete frame or binding for the outer walls of the furnace.

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

1. In a brick-lined or brick-built apparatus for heating air by the direct admixture thereof with of the hot products of combustion free of smoke from a fireplace, the combination with the fireplace, of a series of inlet-tubes along the sides of and slightly above the surface of the fire, admitting fresh and heated air immediately over the fire, a secondary combustion-chamber, an outlet for this chamber, a partitional wall of refractory material between said fireplace and said combustion-chamber, said partitional wall having orifices therein leading the products of combustion from said fireplace to said combustion-chamber, and a second series of air-inlet tubes passing through said brickwork and admitting a further supply of fresh and heated air to the secondary combustion-chamber, whereby the combustion of any smoke or gases that escape unconsumed from the primary fireplace is completely effected in the secondary chamber before the products of combustion pass through said outlet to become mixed with and heat a current of air, substantially as hereinbefore described and represented in the accompanying drawings.

2. In a brick-lined or brick-built apparatus for heating air by the direct admixture thereof with of the hot products of combustion free of smoke from a fireplace, the combination with the fireplace, of a series of inlet-tubes along the sides of and slightly above the surface of the fire, admitting fresh and heated air immediately over the fire, a secondary combustion-chamber, a partitional wall of refractory material between the fireplace and said combustion-chamber, said wall having orifices therein leading the products of combustion from said fireplace to said combustion-chamber, a second series of air-inlet tubes passing through said brickwork and admitting a further supply of fresh and heated air to the secondary combustion-chamber, whereby the combustion of any smoke or gases that escape unconsumed from the primary fireplace is completely effected, a third chamber into which the products of combustion pass from the secondary combustion-chamber, an adjustable opening between the secondary combustion-chamber and said third chamber, an inlet for air to said third chamber to mix with and become heated by the products of combustion, and an outlet for the mixture of heated air and products of combustion from said third chamber, all substantially as and for the purpose hereinbefore described and represented in the accompanying drawings.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

SAMUEL C. DAVIDSON.

Witnesses:

GEORGE GOOLD WARD,
WILLIAM FREEL.