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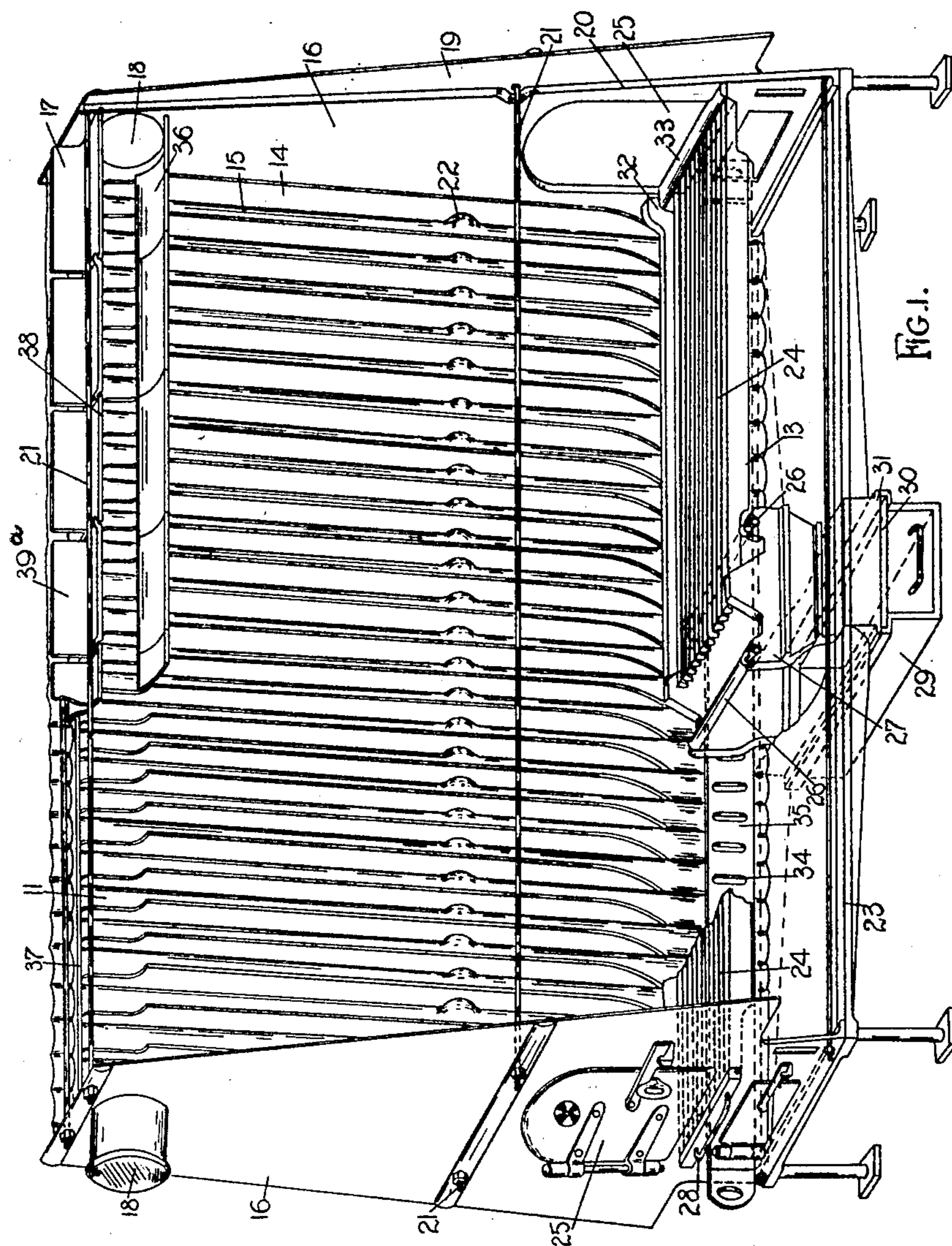
1,683,028

V. ELKINGTON

APPARATUS FOR SUPPLYING A CURRENT OF HEATED AIR OR GAS

Filed Nov. 7, 1927

2 Sheets-Sheet 1



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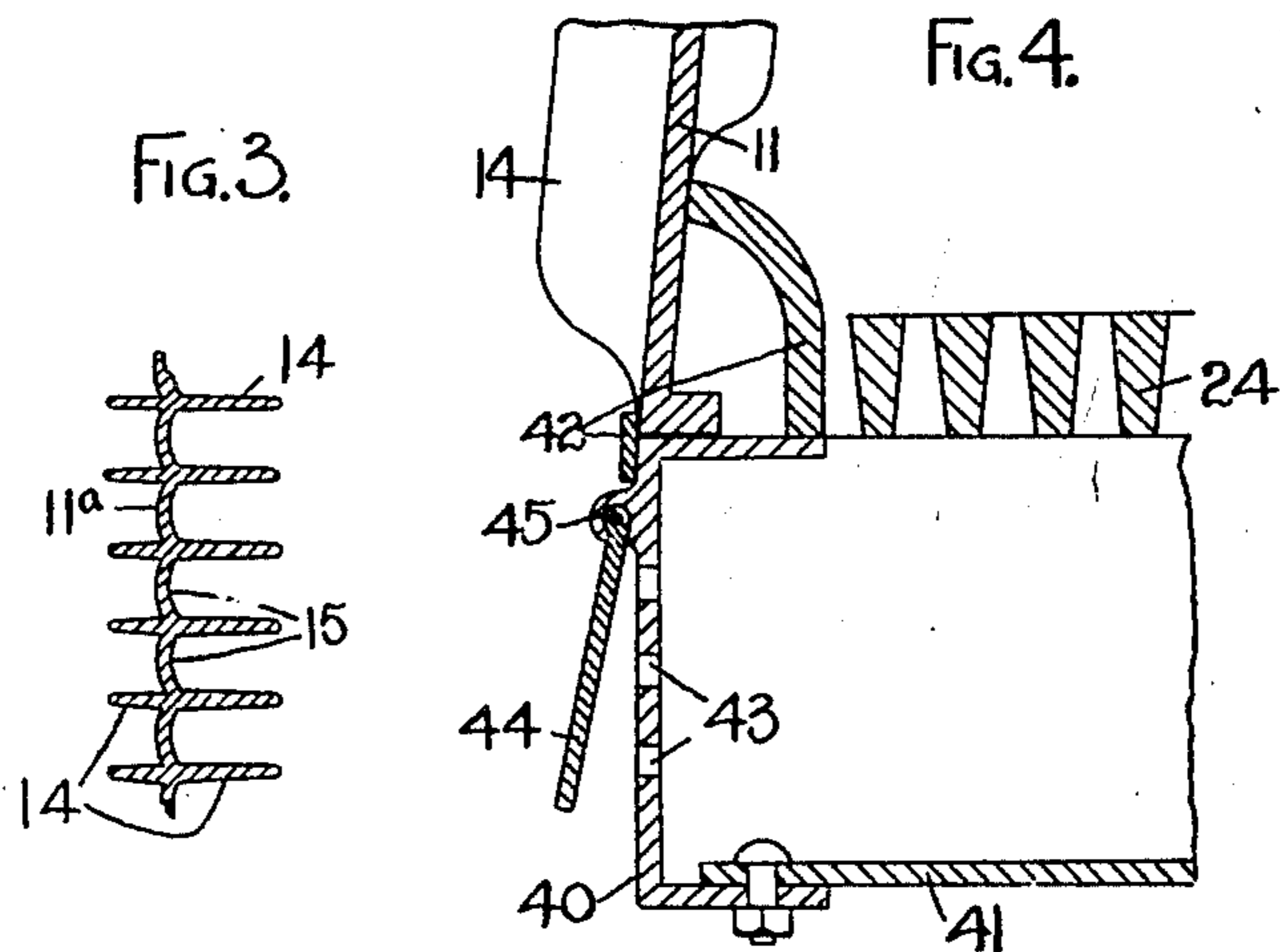
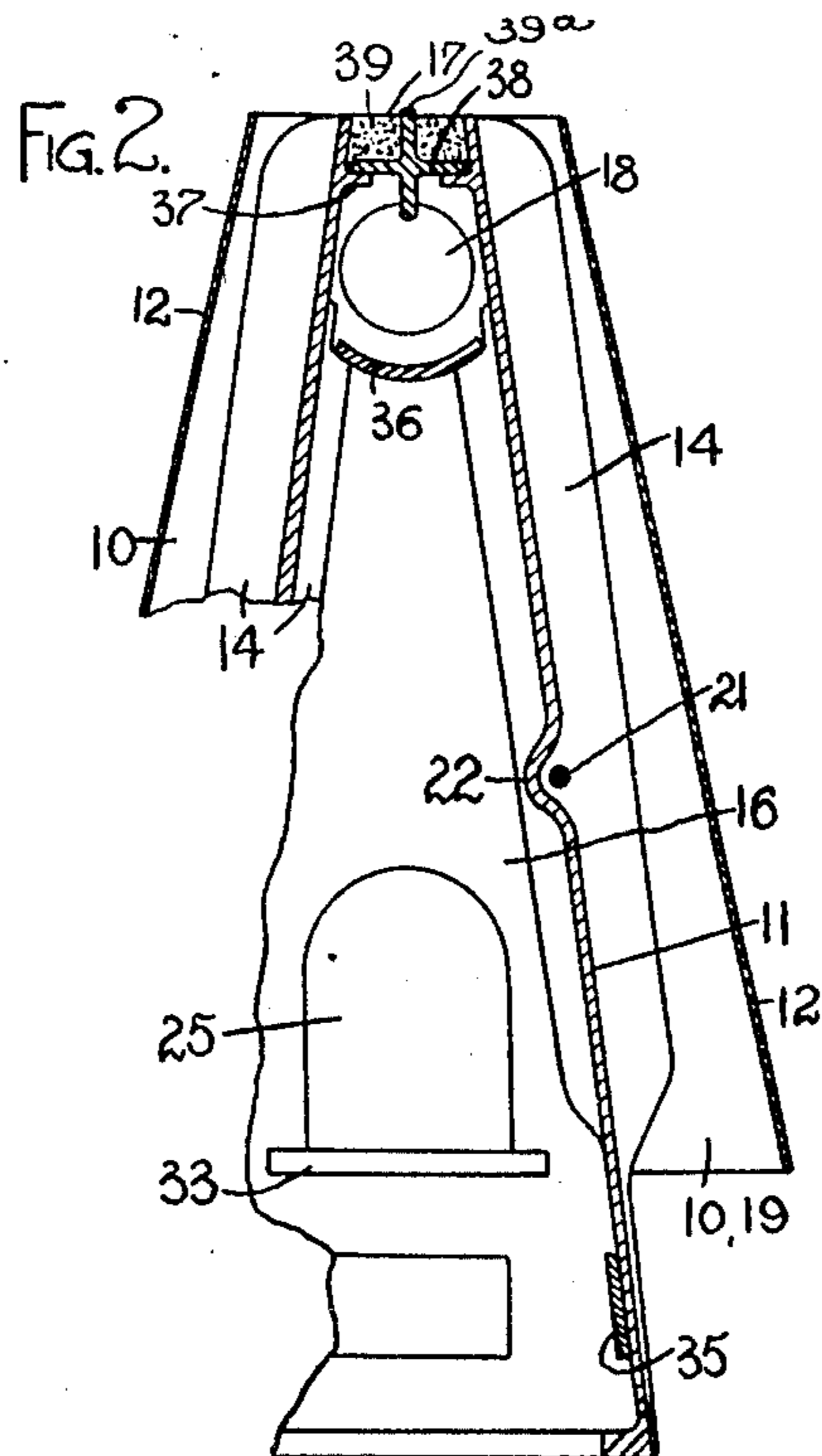
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APPARATUS FOR SUPPLYING A CURRENT OF HEATED AIR OR GAS

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR SUPPLYING A CURRENT OF HEATED AIR OR GAS.

Application filed November 7, 1927, Serial No. 231,740, and in Great Britain November 11, 1926.

This invention relates to apparatus for producing a rapid current of heated air, a suitable gas being included in this expression.

The apparatus is of the kind which utilizes for the purpose mentioned an air-heating passage converging in the direction of flow of the air, the apparatus constructed in accordance with the invention being primarily characterized by the use of a metal wall, heated by an adjacent enclosed heating source having an outlet for products of combustion, and an air-passage, diminishing in area throughout its length, formed by a second wall converging towards the heated wall along the whole of its length in the direction of the outlet, the air to be heated entering the wider end of the air-passage.

Apart from the advantage of the rapid current of heated air thus obtained in the manner referred to above, it will be seen hereinafter that the invention also permits of the construction of a heating apparatus that will be easy to make and assemble and light and cheap in comparison with the usual air-heating apparatus.

In order that the invention may be more readily understood, a furnace constructed to carry the same into practice will now be described with reference to the accompanying drawings, wherein:—

Fig. 1 is a perspective view, partly broken away, of the complete furnace,

Fig. 2 is a transverse sectional view thereof;

Fig. 3 is a horizontal sectional view of a detail, while

Fig. 4 is a fragmentary vertical section of a modified detail.

In the arrangement illustrated in Fig. 1 (which has experimentally given satisfactory results) the air to be heated is allowed free access to the spaces 10 between two pairs of converging walls 11 and 12 forming, together with a grate or hearth designated generally 13 for the burning of solid fuel, a furnace in which the air to be heated is kept out of contact with the products of combustion.

The two inner walls 11 of the two pairs referred to are of $\frac{5}{16}$ inch metal and are gilled at 14 and corrugated at 15 to provide a large area or surface for heat reception and heat transference. They are connected together at the ends by end-plates 16 and at the top by a suitable sealing-device, designated generally 17, to be hereinafter described, so as to prevent undesirable escape of the products of

combustion from the hearth or equivalent, which is placed between the said two walls. Outlet pipes or flues 18 are provided to lead the said products away from the top of the furnace. The end-plates 16 connecting the two inner walls 11 are extended laterally at 19 to support the two outer walls 12, which may be of any desired material and thickness but are preferably, as shown, of sheet-metal for lightness and cheapness. The end-plates are provided with integral flanges 20 to position the walls 11 correctly and are either grooved or provided with an equivalent arrangement (not shown) whereby the outer walls 12 may be readily placed in position. For example, the said walls might be received in the space between two pairs of projections on the end-plates or might be slotted or perforated to engage projections or screws thereon. The two walls 11 and 12 of each pair slope towards one another as indicated in Fig. 2 and the inner walls also converge in the upward direction. The rapid current of air produced by the furnace absorbs the heat of the furnace extremely quickly, with the result that the inner walls, in spite of their comparative thinness, remain at temperatures having no materially disadvantageous effect on them, while the products of combustion are cooled down considerably before reaching the top of the furnace. Thus, there is no need to provide room for the expansion of the said products and the outlets therefor may be made of thin and inexpensive metal. Moreover, the decreasing section of the furnace in the upward direction causes a more intimate contact of the uprising combustion gases with the inner walls than would be the case with a parallel-wall arrangement. The greater the slope of the said inner walls the easier is the flow of air, while due to the relative positions of the walls the said air is caused to impinge on the heated inner walls instead of passing directly upwards.

The inner walls 11 are made from interengaging cast sections 11^a (Fig. 3) and are held together by bolts 21 secured to the end-plates 16. These bolts are advantageously arranged outside the inner walls, i. e. away from the heat of the source of combustion, the said walls being curved at 22 to allow this (Fig. 2).

The structure formed by the two pairs of walls 11 and 12, end-plates 16 and sealing-member 17 is placed on a cast support 23, which also acts as an ash-pan, so as to be capable of free movement during expansion

and contraction. The fire-bars 24 of the grate or hearth 13 are carried in slots in the end-plates 16, which are provided with suitable charging doors 25. In order to allow for easy removal of ash and clinker from the fire-bars of the grate or hearth without the disadvantage of the admission of an excess of air to the fire, and also, in some circumstances, without allowing the fumes from the ash and clinker to contact with the air to be heated, the said fire-bars are arranged in two groups so that two separate grates or hearths are thereby formed, and are supported on rollers 26 journaled in a cast bracket 27 supported in the centre of the ash-pan 23, the two groups normally contacting but being movable independently from the outside by handles 28 to allow the raking of the ash from the bars into the space thus left below and at the inner ends of the two groups and thus into a suitable slidable receptacle 29. A damper or division plate 30 is arranged between the said receptacle and the ash-pan 23, the said receptacle being carried on flanges 31 on the bottom of the bracket 27. It will be seen that by these arrangements the air to be heated does not become contaminated with combustion products from the furnace. This is of importance when the heated air is to be used for, say, drying, such as in the drying of hops or malt. Baffles or side-bars 32 prevent escape of air from the ash-pit without passing through the fire-bars, these baffles being carried by projections 33 on the end-plates 16.

To ensure a uniform supply of air to the hearth or grate, or to the two sections thereof if a divided grate be used, the lower ends of the walls 11 are perforated or slotted along their length at 34, these slots being controlled by a similarly perforated or slotted shutter control-member 35 slidable in slots in the end-walls 16 (Figs. 1 and 2).

With one or two outlet-pipes 18 (as will usually be provided) for the products of combustion at the ends of the furnace there is a risk that the majority of the said products will tend to flow straight out through the same instead of passing upwardly in intimate contact with the gilled portions of the inner walls 11 of the furnace as is desirable, and to guard against this the top of the furnace is adapted to receive a division or baffle plate 36 arranged to cause the desired effect, this plate conveniently being adapted to rest on the inner gills 14 on the walls 11, as shown:

The spaces 10 between the two pairs of walls hereinbefore referred to are open at top and bottom but the inner or heating walls 11 are connected together at the top as previously mentioned. The connection and necessary sealing at this point are effected by a sand-seal, constructed by forming the inner walls with flanges 37 on which rest a

series of inter-engaging cast plates 38 on which sand is laid as at 39 (Fig. 2) to prevent leakage of combustion products through the abutting faces of the flanges 37 and plates 38, as will be readily understood. The plates 38 are preferably provided with heat-radiating ribs 39^a, extending vertically upwards (Fig. 1) and, if desired, downwards also (Fig. 2).

The outlet pipes 18 are preferably provided with dampers or like controlling devices so as to provide a second control for the flow of the combustion air and combustion products.

Turning now to the modification shown in Fig. 4, the cast ash-pan construction previously described is here replaced by a built-up structure constituted by two channel-iron members 40 connected at the bottom by a plate 41 bolted thereto, and at the ends by suitable closures (not shown). On the top flanges of these channels rest the heating walls 11 as in the previous construction, these walls being correctly positioned by cheek-plates 42. In this construction, as in that previously described, the ash-pan itself, instead of the walls 11, may be perforated or slotted (as indicated at 43) to form the air inlets hereinbefore designated 34. This has the advantage of allowing the gills 14 to be extended a much greater distance down the walls 11.

Instead of the air inlets being controlled by a slidable shutter, they are in the present instance controlled by damper-like members 44 pivoted to the channels 40 at 45.

Other detail modifications will be readily apparent to those skilled in the art.

What I claim is:—

1. A furnace for producing a rapid current of heated air, comprising a pair of end plates, two pairs of walls extending between the said end plates and constituted by a pair of inner metal heating walls converging inwardly and upwardly towards one another throughout their entire length, and a pair of outer walls converging inwardly and upwardly towards the respective inner heating walls to form open air passages diminishing in area from their lower to their upper ends and into the wider lower ends of which air to be heated enters, a heating source confined between the end plates and the said inner walls, and an outlet at the top of the furnace for the products of combustion.

2. A furnace for producing a rapid current of heated air, comprising a pair of end plates, two pairs of walls extending between the said end plates and constituted by a pair of inner metal heating walls having gills on both surfaces and converging inwardly and upwardly towards one another throughout their entire length, and a pair of outer walls converging inwardly and upwardly towards the respective inner heating walls to form open air passages diminishing in

area from their lower to their upper ends, into the lower ends of which passages air to be heated enters, a heating source confined between the end plates and the said inner walls, and an outlet at the top of the furnace for the products of combustion.

3. A furnace for producing a rapid current of heated air, comprising a pair of end plates, two pairs of walls extending between the said end plates and constituted by a pair of inner metal heating walls having gills on both surfaces and converging inwardly and upwardly towards one another throughout their entire length, and a pair of outer walls converging inwardly and upwardly towards the respective inner heating walls to form open air passages diminishing in area from their lower to their upper ends, into the lower ends of which passages air to be heated enters, a horizontal baffle plate resting upon the gills on the inner surfaces of the inner heating walls adjacent the upper ends thereof, a heating source confined between the end plates and the said inner walls, and an outlet at the top of the furnace for the products of combustion.

4. A furnace for producing a rapid current of heated air, comprising a pair of end plates, two pairs of walls extending between the said end plates and constituted by inner metal heating walls converging inwardly and upwardly towards one another throughout their entire length, and a pair of outer walls converging inwardly and upwardly towards the respective inner heating walls to form open air passages diminishing in area from their lower to their upper ends, into the lower ends of which air to be heated enters, a plate fitted loosely between the upper ends of the inner heating walls and having a sand seal to close the top of the furnace, a heating source confined between the end plates and the said inner walls, and an outlet at the top of the furnace for the products of combustion.

5. A furnace for producing a rapid current of heated air, comprising in combination a hearth, a base member, a pair of inner metal heating walls converging inwardly and upwardly towards one another throughout their entire length and supported on the base member, said walls enclosing the said hearth at their lower ends, a pair of end plates connected to the said inner walls, outlets at the top of said end plates for the products of combustion from the hearth, and a pair of outer walls converging inwardly and upwardly towards the respective inner heating

walls to form open air passages diminishing in cross section from their lower to their upper ends, into the wider lower ends of which passages cold air to be heated enters.

6. A furnace for the production of a rapid current of heated air comprising a base member, a pair of end plates mounted upon the said base member, a pair of inner metal heating walls converging inwardly and upwardly towards one another throughout their entire length, a pair of hearths disposed between the lower ends of the said inner walls and extending from the respective end plates to the centre of the furnace, the said hearths being reciprocable longitudinally, a central ash pan communicating with a removable ash receptacle, outlets in the upper ends of the said end plates for the products of combustion from the hearths, and a pair of outer walls extending between the said end plates and converging inwardly and upwardly towards the inner heating walls to form air passages diminishing in cross section from their lower to their upper ends, into the wider lower ends of which passages air to be heated enters.

7. A furnace for the production of a rapid current of heated air comprising a base member, a pair of end plates mounted upon the said base member, a pair of inner metal heating walls having gills on both faces and converging inwardly and upwardly towards one another throughout their entire length, a pair of hearths disposed between the lower ends of the said inner walls and extending from the respective end plates to the centre of the furnace, the said hearths being reciprocable longitudinally, a central ash pan communicating with a removable ash receptacle, a baffle plate resting upon the gills on the inner faces of the said inner walls adjacent the upper ends thereof, a plate fitting loosely between the upper ends of the said inner walls and having a sand seal to close the top of the furnace, outlets in the upper ends of the said end plates for the products of combustion from the hearths, and a pair of outer walls extending between the said end plates and converging inwardly and upwardly towards the inner heating walls to form air passages diminishing in cross section from their lower to their upper ends, into the wider lower ends of which passages air to be heated enters.

In testimony whereof I have signed my name this 28th day of October, 1927.

VIVIAN ELKINGTON.