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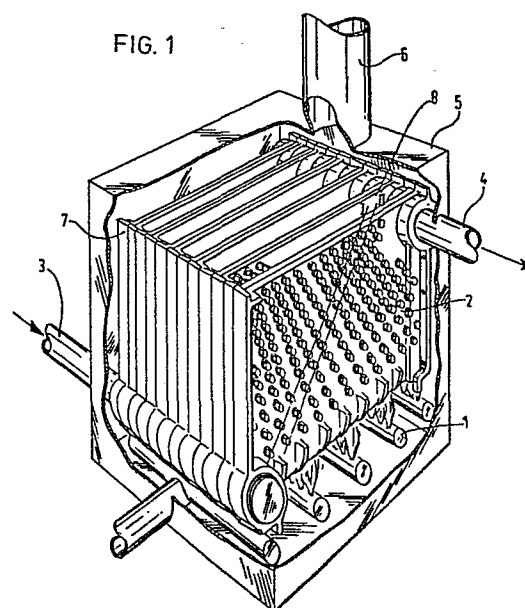
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54 Heat exchanger for use in a central heating boiler or the like and heating apparatus comprising such a heat exchanger.

57 The heat exchanger comprises a plurality of sections (7) arranged side by side, having each a fluid chamber intercommunicating through an inlet and outlet nipple, a flue passage (8) being formed between said sections, whereas on the sidewall of each section protruding pins (10) arranged in rows, provided with flat surfaces (11) parallel to said rows, said rows are inclined to and converging in the direction of length of the flue passage so as to form inclined and progressively narrowing flow channels in said flue passage.



TITLE MODIFIED
see front page

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Heat exchanger for use in a central heating boiler or the
like

The invention relates to a heat exchanger for use in a central heating boiler or heating apparatus, said exchanger comprising a plurality of sections arranged side by side and having each a fluid chamber intercommunicating
5 through an inlet and outlet nipple, a flue passage channel being formed between the sections, in which channel project pins arranged on the sidewalls of the sections.

In the heat exchanger of the kind set forth in the preamble the fluid contained in the sections is
10 heated by heat transfer from the flue gases across the walls of the sections to the fluid.

The pins projecting in the flue channels serve to improve this heat transfer. In practice it has, however, been found that despite the many shapes of the pins
15 employed the efficiency of such a heat exchanger is comparatively low.

The invention has for its object to provide a heat exchanger which produces such a turbulence of the flue gases that the heat transfer from the flue gas
20 to the wall of the heat exchanger becomes optimal, whilst the flow of the fluid in the sections is improved so that the heat absorbed from the walls of the sections is transferred to the optimum to the fluid.

According to a first aspect of the invention the outer surface of the pins is flattened along the circumference at one or more places, the flat surface of the pin being at an angle to the direction of length of the flue channel.

5 Thus the flow of the flue gases in the flue channel formed between the sections is subjected to a change of direction, as a result of which the flue gas particles are mixed.

In a preferred embodiment the pins are arranged in rows inclined to the direction of length of
10 the flue channel, the flat surfaces of the pins being parallel to the row so that inclined flow channels are formed in the flue channel.

In order to obtain a relatively longer residence time of the hot flue gas on the affluent side
15 of the heat exchanger, the rows of pins are disposed so as to converge in the direction of passage of the flue channel. Thus progressively narrowing flow channels are formed, which have a kind of venturi effect on the flue gas.

20 As an additional measure in this respect the distance between the pins of the same row can be progressively reduced in the direction of passage of the flue channel.

In order to enhance the turbulence in
25 the flue channel the flat surfaces on the pins on one side of a section are specularly symmetrical to the other side. In assembling the sections crossing flow channels will form in the flue channel and produce violent turbulence of the flue gas at the interface between
30 the sections.

In order to obtain a satisfactory heat transfer between the wall of a section of the heat exchanger and the fluid contained therein, the fluid chamber comprises one or more guide partitions.

35 From the inlet nipple these partitions are preferably converging towards the section wall bombarded by the flue gas as a result of which the rate of flow of the fluid in the section along this hot wall will be high and hence also the cooling effect.

The invention will be described more fully with reference to a drawing.

The drawing shows in:

fig.1 a perspective view of a heating apparatus
5 comprising a heat exchanger in accordance with the invention,
fig.2 a side elevation of a section used in the heat exchanger,

fig.3 and 4 a bottom view and a plan view respectively of the section of fig.2,

10 fig.5 a sectional view taken along the bottom side of the section of fig.2,

fig.6 and 7 a plan view and a side view respectively of a pin mounted on the sidewall of the section.

The heating apparatus shown in fig. 1 mainly
15 comprises a gas burner 1 and a heat exchanger 2 arranged above said burner and having an inlet and an outlet conduit 3 and 4 respectively. The assembly is surrounded by an envelope 5, with which a chimney 6 communicates.

The heat exchanger 2 consists of a series
20 of sections 7 arranged side by side to be described more fully hereinafter with reference to figs. 2 to 6. Between the sections flue gas channels 8 are formed so that the flue gases emanating from the burner 1 can flow through these channels 8 towards the outlet pipe 6.

25- The section shown in fig.2 is mainly formed by a hollow casing in which a fluid chamber is formed, which communicates through an inlet nipple 9 and an outlet nipple 14 with the chambers of the neighbouring sections. The sidewall of the section 7 has a substantially
30 rectangular shape and has a large number of pins 10 projecting into the flue channel 8 formed between two sections. The pins shown in fig.2 are disposed in converging rows, which is indicated by the line I-II in fig.2.

On both sides of its circumference each pin 10 has a flat
35 surface 11 (see also fig.6). The flat surfaces extend parallel to the row of pins so that between the rows of pins flow channels are formed which are in a position inclined to the main direction of flow of the flue gas from bottom to top.

In the direction of flow of the flue gas the distances between the pins of a row decrease.

On the bottom side or the affluent side of the section 7 are arranged guide ribs 15: see also fig.3.

5 According to one aspect of the invention the surfaces 11 of the pins 10 are mirror-symmetrical on both sides of a section 7 as shown in fig.4. It will be obvious that in assembling the sections the rows 1 - 2 on one side (fig.2) will cross those on the other side
10 fo the same section so that in assembling two sections 7 the pins 10 facing one another will be in crosswise positions.

 In the fluid chamber of the section 7, near its affluent side 12 are arranged internal guide partitions 13 converging from the inlet stub 9 towards
15 the affluent side 12. In the embodiment shown five partitions are arranged in overlapping positions in a manner such that the fluid from the inlet stub 9 will mainly flow along the wall 12 and will partly find its way between the partitions 13 (see the arrows P1 and P2). Owing to these partitions
20 13 the rate of flow P1 will be relatively high whilst no dead corners will be formed in the fluid chamber of the section 7, so that optimum heat transfer is ensured.

 The invention is not limited to the embodiment described above. For example, the pins may as an alternative
25 be disposed in staggering rows I,II so that the flow direction of the flue gas in the flow channel changes repeatedly. This may further enhance the desired turbulence.

WHAT IS CLAIMED IS:

1. A heat exchanger for use in a central heating boiler or suchlike heating apparatus comprising a plurality of sections arranged side by side and having each a fluid chamber, said chambers intercommunicating through
5 an inlet nipple and an outlet nipple, a flue gas passage being formed between the sections into which project pins mounted on the sidewalls of the sections characterized in that the circumferences of the pins are flattened at one or more places, the flat surface of the pin being
10 at an angle to the direction of length of the flue gas channel.
2. A device as claimed in claim 1 characterized in that the pins are disposed in rows inclined to the direction of length of the flue channel, the flat surfaces of
15 the pins extending parallel to the row.
3. A device as claimed in claims 1 and 2 characterized in that the rows of pins converge in the direction of passage of the flue channel.
4. A device as claimed in claims 1 to 3,
20 characterized in that in the same row the distances between the pins decreases in the direction of passage of the flue channel.
5. A device as claimed in claims 1 to 4 characterized in that the flat surfaces on one side of
25 a section are mirror-symmetrical to those on the other side thereof.
6. A device as claimed in anyone of the preceding claims characterized in that on the affluent side of the flue gas the fluid chamber is provided with one or
30 more guide partitions.
7. A device as claimed in claim 6 characterized in that the or each partition converges from the inlet nipple to the bombarded wall of the section.

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8. A device as claimed in anyone of the preceding claims characterized in that the bombarded wall of the section is provided with ribs guiding the flue gas.

9. A heating apparatus comprising a heat
5 exchanger as claimed in anyone of the preceding claims.

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FIG. 1

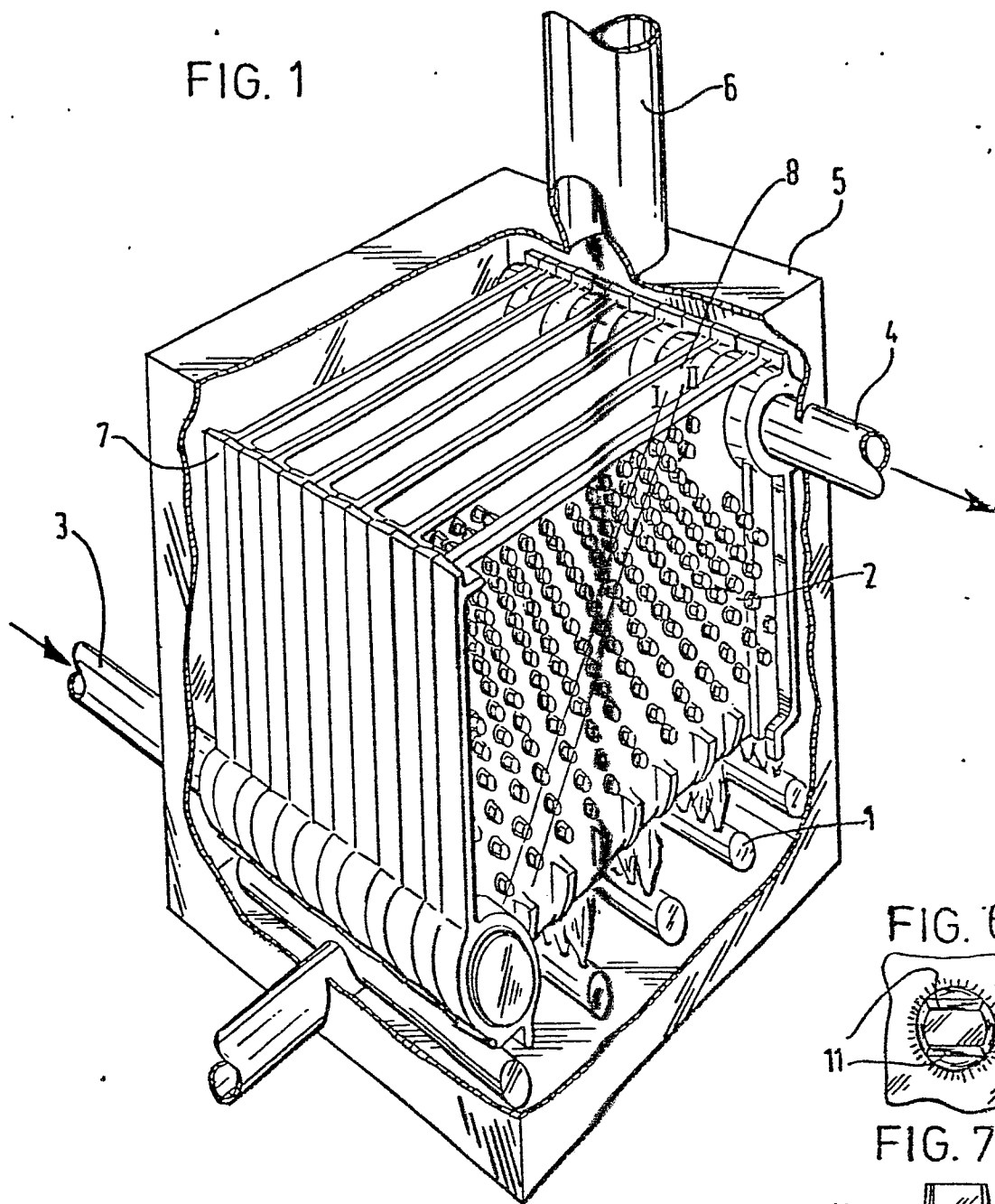


FIG. 6

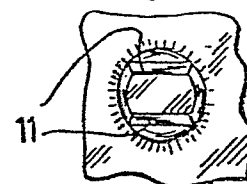


FIG. 7

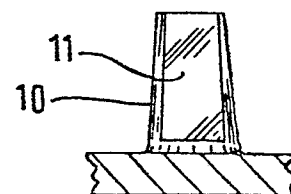
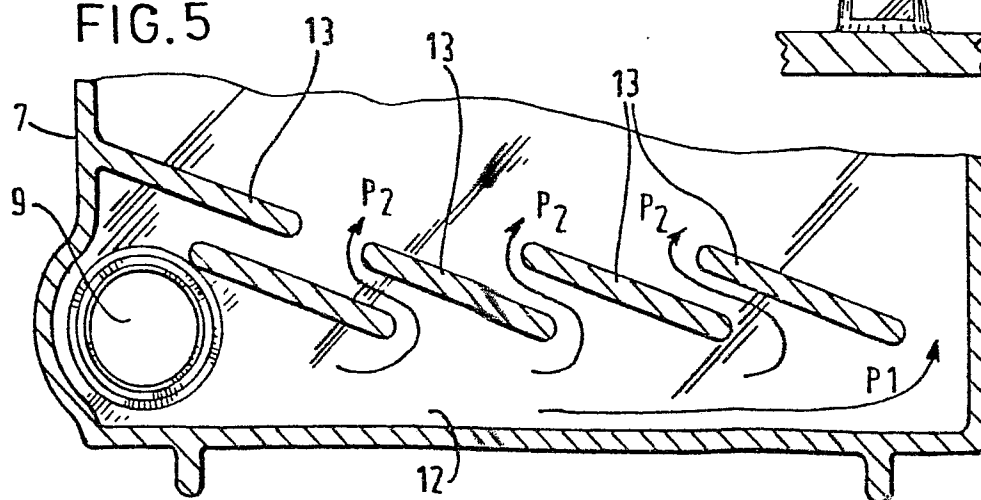


FIG. 5



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"2/2"

FIG. 4

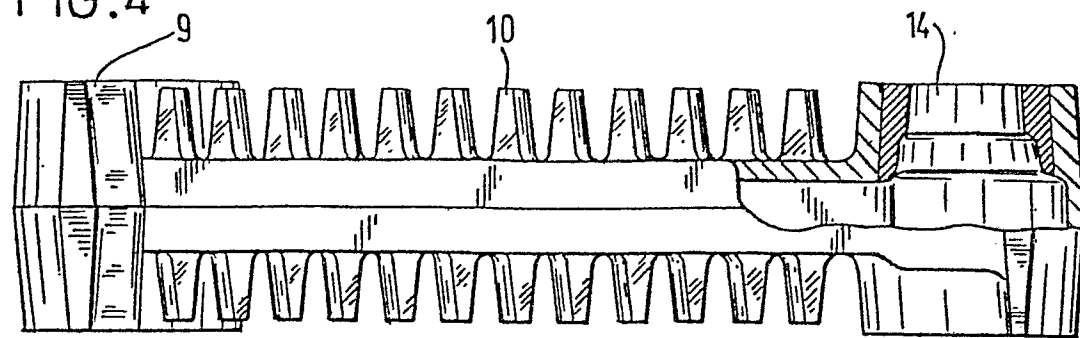


FIG. 2

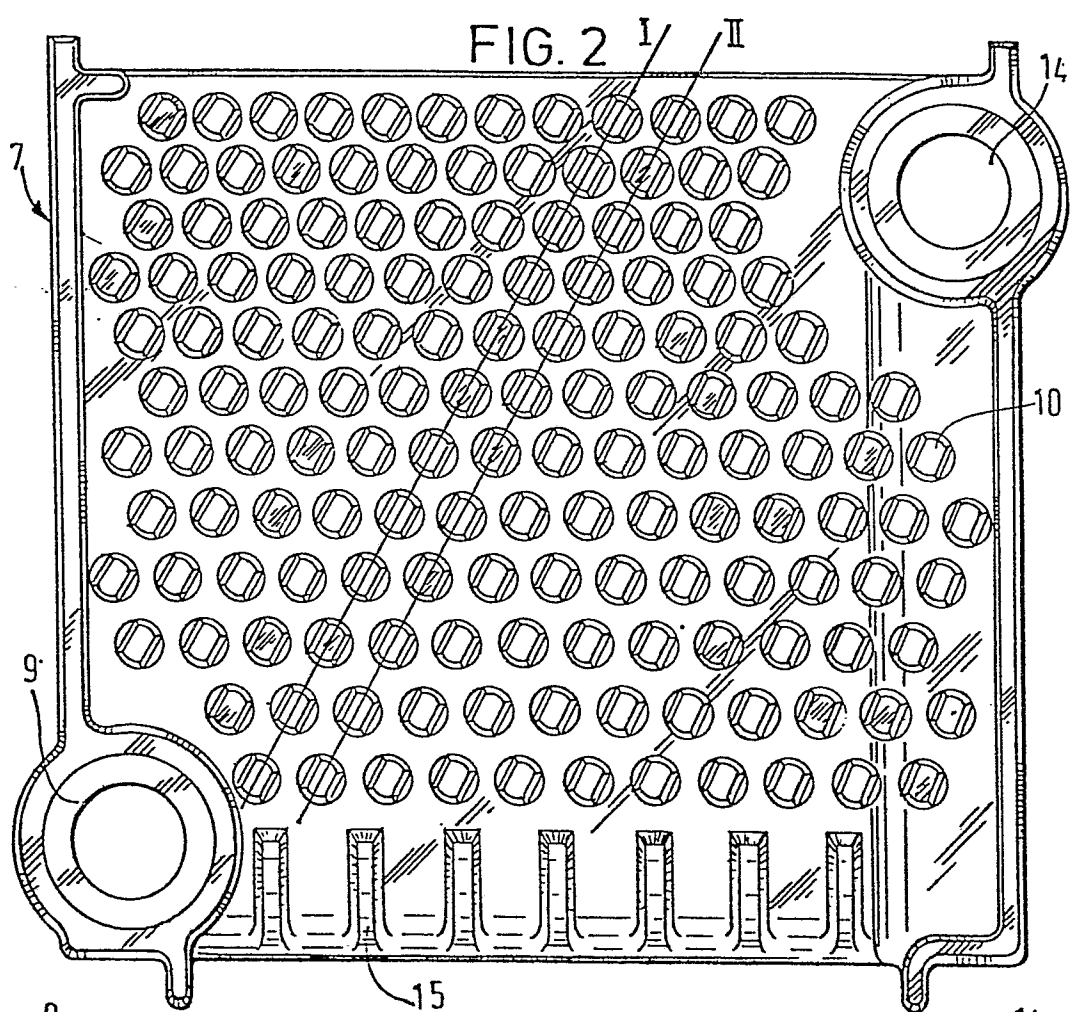
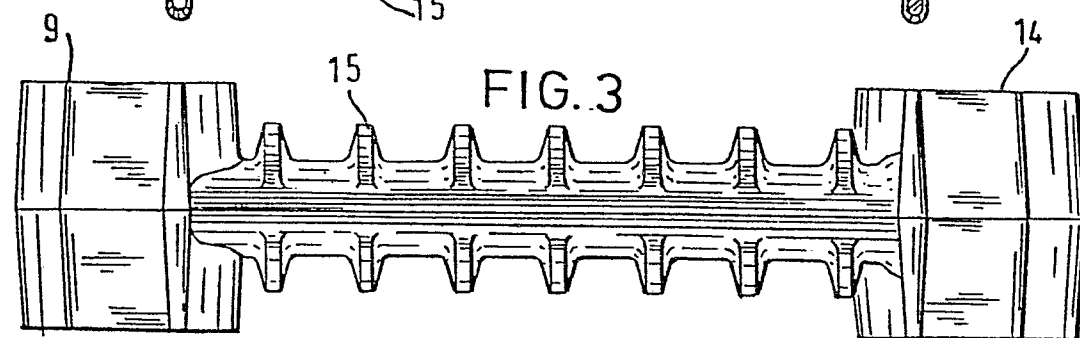


FIG. 3





European Patent
Office

EUROPEAN SEARCH REPORT

0021512

Application number
EP 80 20 0553

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
X	FR - A - 2 308 072 (BURNHAM) * Claims 1,2; figures *	1,2,5	F 24 H 1/38
	-- US - A - 1 960 310 (HUNTER) * Page 1, lines 65-70; page 2, lines 7-10; figure 6 *	6,8	
			TECHNICAL FIELDS SEARCHED (Int.Cl. ³)
			F 24 H
			CATEGORY OF CITED DOCUMENTS
			X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons
			&: member of the same patent family, corresponding document
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 11-09-1980	Examiner VAN GESTEL