

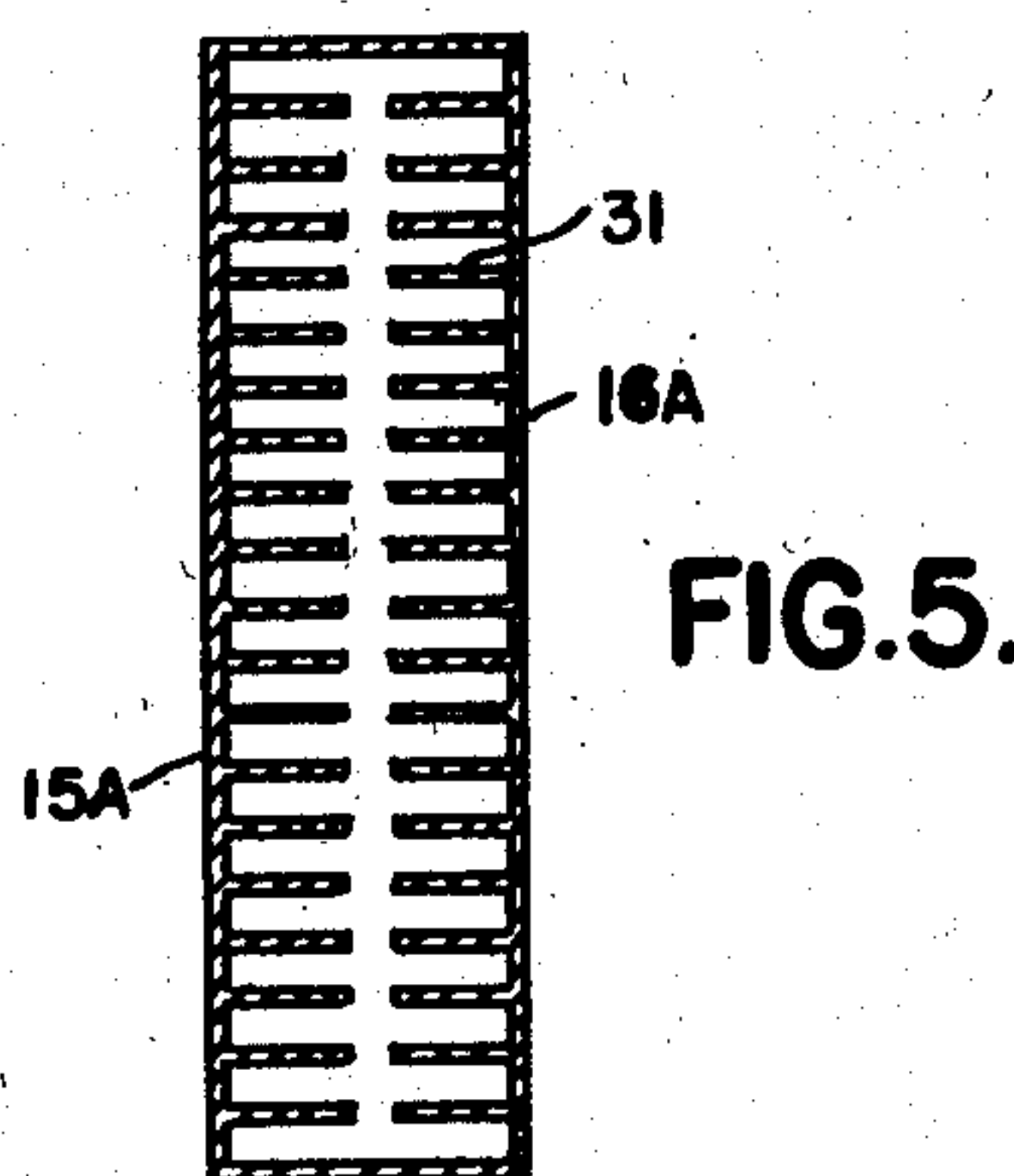
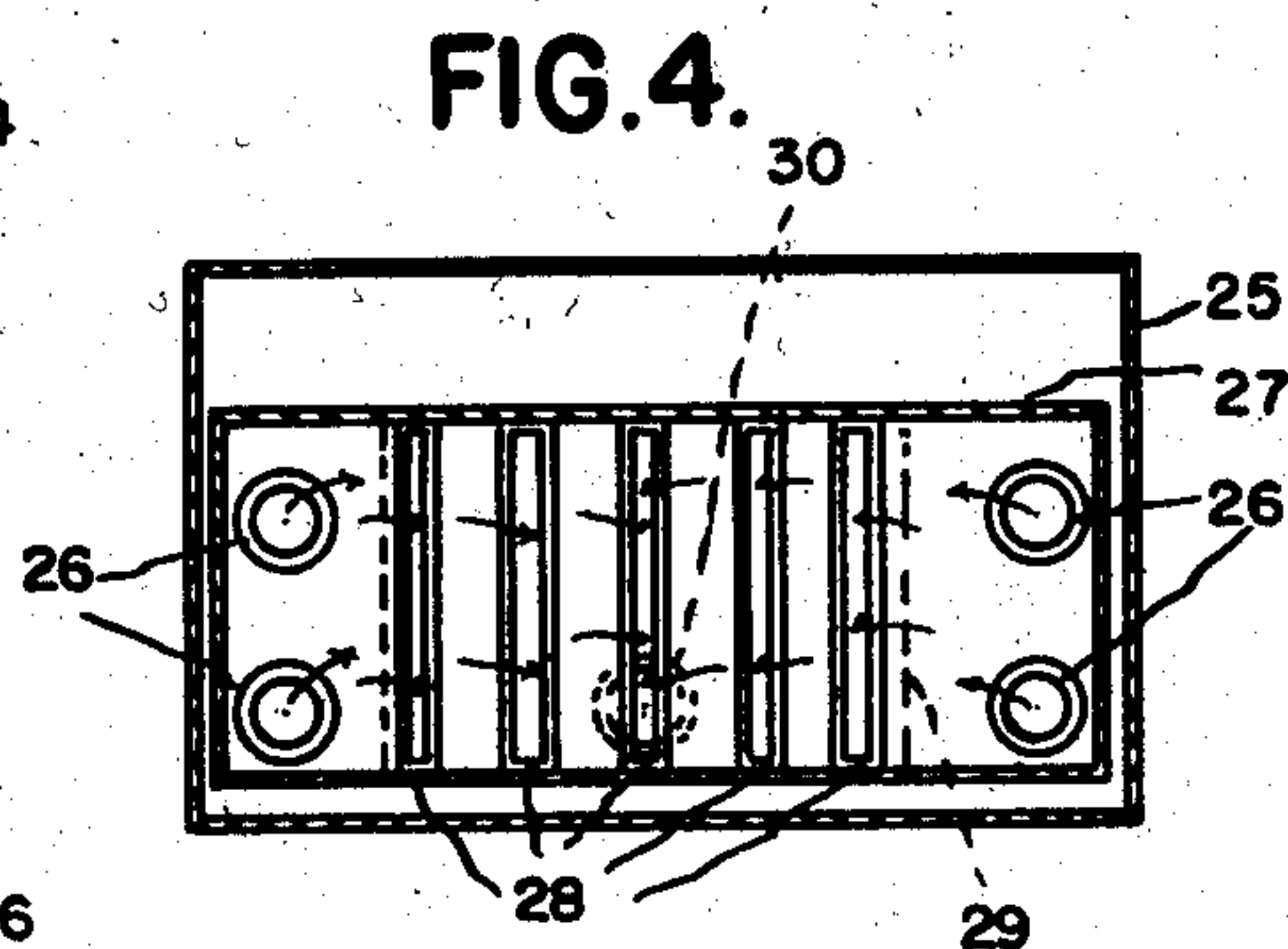
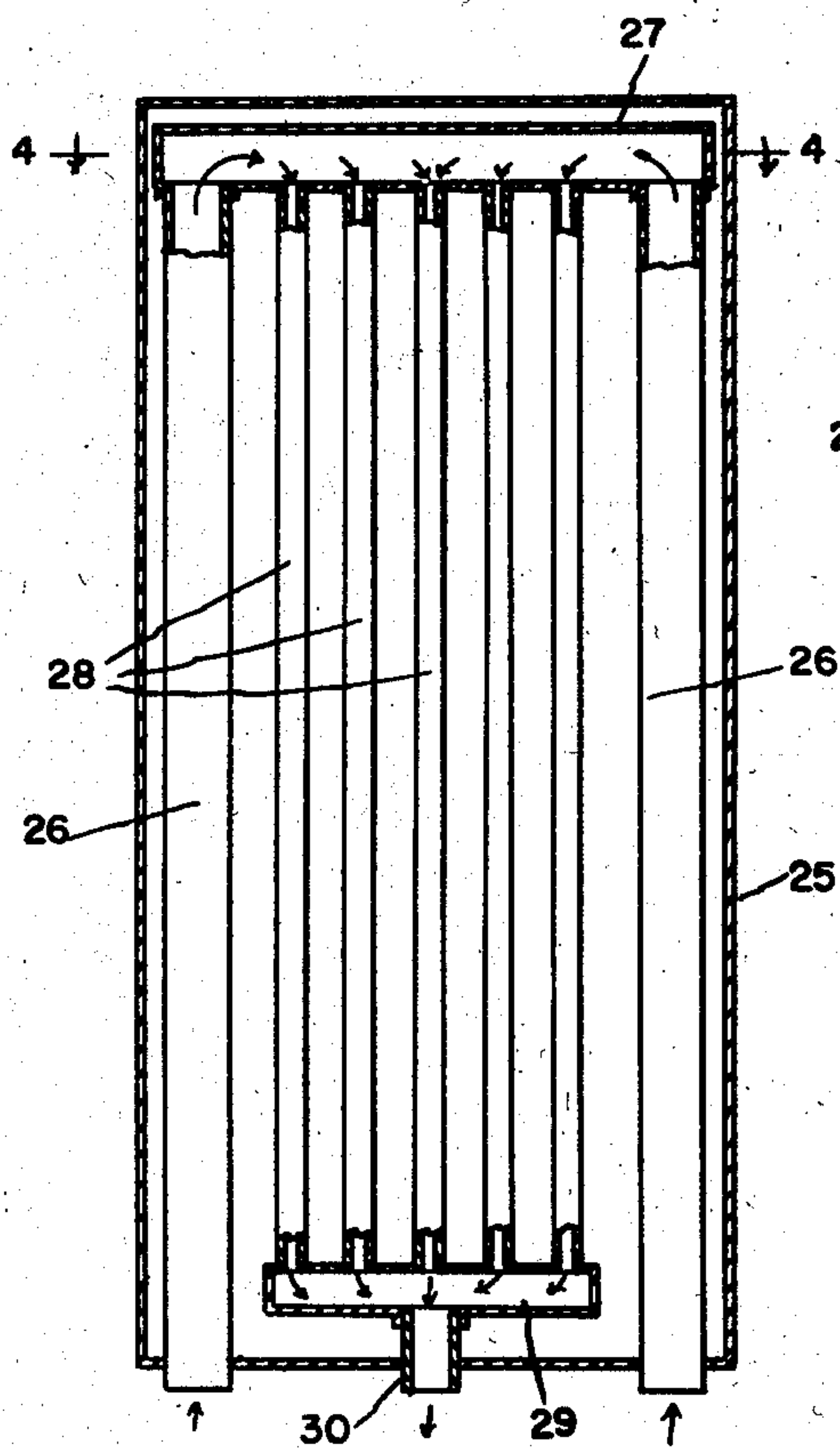
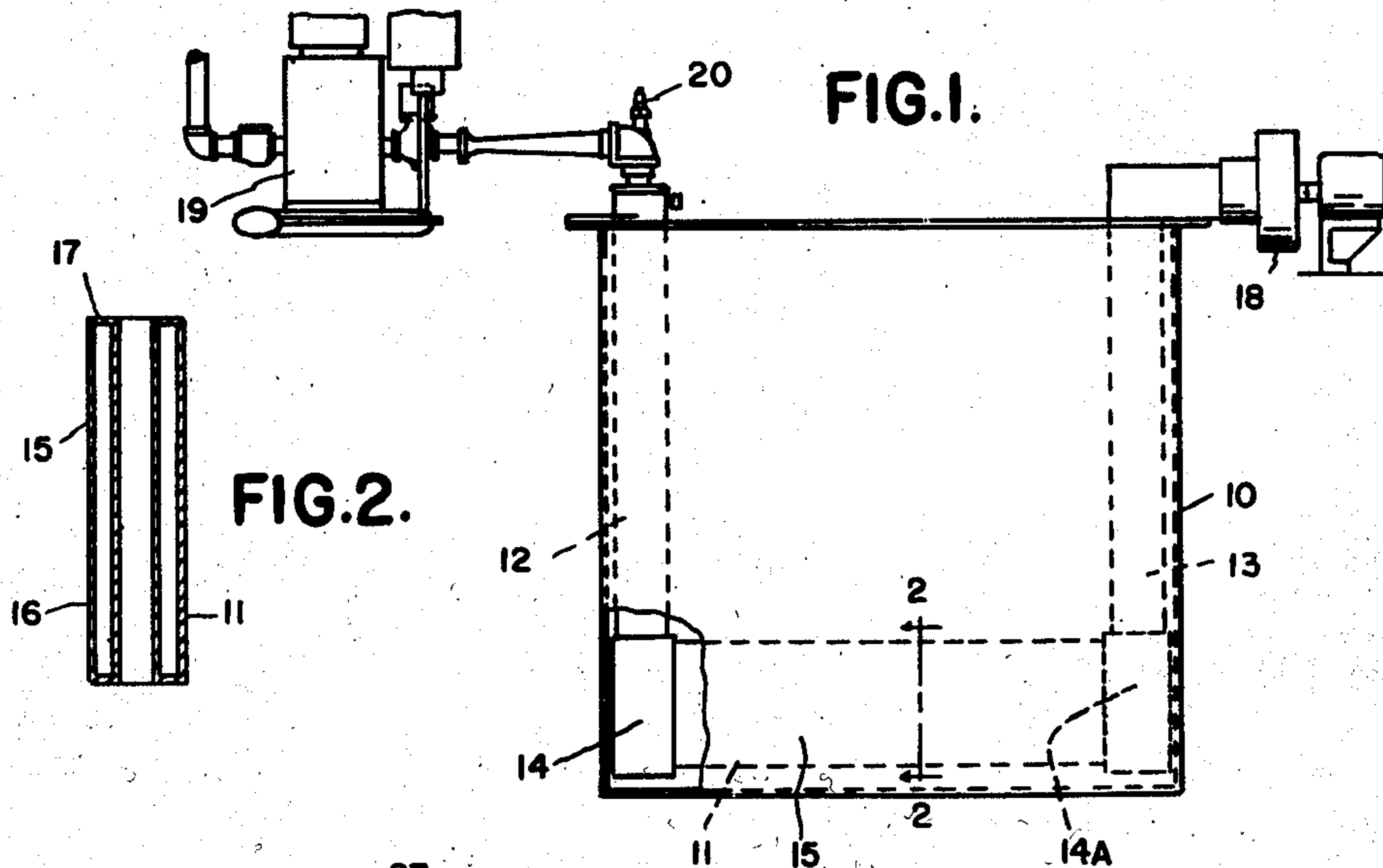
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2,543,835

GAS-FIRED IMMERSION HEATING APPARATUS

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GAS-FIRED IMMERSION HEATING
APPARATUS

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2 Claims. (Cl. 126—360)

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The invention relates to gas-fired furnaces, and more particularly to gas-fired immersion heaters for economically heating liquids.

An object of the invention is to provide a compact arrangement of immersed heating flues having large surface areas for increasing the transfer of heat from the burning gases to the liquid.

Another object is to provide an immersion heater with flues that may be more readily cleaned.

These and other objects are attained by the apparatus hereinafter more fully described and illustrated in the accompanying drawings, wherein

Figure 1 is a side view of a heating apparatus embodying the invention;

Figure 2 is a cross section on line 2—2 of Figure 1;

Figure 3 is a plan view partly in section of a modified form of apparatus;

Figure 4 is a cross section on line 4—4 of Figure 3;

Figure 5 is an enlarged cross section of a rectangular flue of modified form.

Referring to Figures 1 and 2, 10 is a tank for the liquid to be heated and 11 is the heating unit comprising a vertical cylindrical inlet conduit 12 and a similar outlet conduit 13. Each conduit has at the bottom thereof a rectangular header 14 and 14A respectively between which extend two spaced rectangular flues 15. Each flue has wide side surfaces 16 and narrow edges 17.

A suction fan 18 is connected to the outlet conduit 13 and a gaseous fuel and air mixing device 19 is connected to the inlet conduit 12, there being an electric igniter 20 for delivering a burning gaseous mixture into the inlet conduit where it is drawn by the suction fan through the flues. Suitable automatic controls are described in my Patent No. 2,259,299, issued October 14, 1941.

The principal advantage of the construction, as above described, is that the rectangular flues form a large surface area in contact with the liquid compared to the volume of the flue passages, thus greatly increasing the transfer of heat from the burning gases to the liquid. Also the rectangular form of the flues facilitates the cleaning of the outer surfaces thereof after continued use.

In Figures 3 and 4, a modified form of immersion heater is shown. In this construction the tank 25 has 4 cylindrical tubes 26 extending lengthwise of the tank along the sides thereof.

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These tubes have their inlet ends projecting through one end of the tank and at the opposite end are connected to a rectangular header 27. A series of rectangular flues 28 extend lengthwise of the tank, being connected at one end to the header 27 and at the other end to a second rectangular header 29 which in turn has an outlet pipe 30 projecting through the same end of the tank as the inlet ends of the tubes 26. Each of the tubes 26 is provided with a mixing and igniting device while the outlet pipe 30 is connected to a suction fan. In the modified construction as described, the rectangular flues 28 have the same advantage as in the first described construction, in that they present a large surface area in contact with the liquid and are readily cleaned.

Also there is a further advantage when the rectangular flues are arranged, as shown, with their narrow edges in a horizontal plane and their wide sides in a vertical plane, because this permits the circulating liquid in the tank to sweep against the sides and more rapidly extract the heat from the flues.

It will be understood that the invention also contemplates a construction as shown in Figures 1 and 2 wherein there are more than two flues 15 extending between the headers 14 and 14A and conversely wherein there is only a single flue between the headers.

In Figure 5 there is illustrated a rectangular flue 15A having a series of fins 31 projecting inwardly from each of the side surfaces 16A. This greatly increases the metal surface contacting with the gases traveling through the flue and more quickly dissipates the heat of combustion to the side walls. It has been found that an internally finned construction of this type conducts the heat from the flue gases to the liquid in the tank so much more rapidly that the total length of flue may be greatly decreased while maintaining the same efficiency as with a much longer rectangular flue without the fins.

What I claim as my invention is:

1. An immersion heater comprising a cylindrical inlet conduit adapted to extend into a liquid, a gaseous fuel and air mixing device connected to the inlet of said conduit for delivering burning gases therinto, an outlet conduit, a suction fan connected to said outlet conduit, a pair of headers connected respectively to said inlet and outlet conduits and a series of rectangular flues extending between said headers, the cross section of each flue having one dimension substantially greater than the other, providing parallel pas-

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sageways for said burning gases having large surface area compared with volume to increase the transfer of heat from the burning mixture to said liquid.

2. An immersion heater comprising an inlet 5 conduit adapted to extend into a liquid, a gaseous fuel and air mixing device connected to said inlet conduit for delivering burning gases thereinto, an outlet conduit, a suction means connected to said outlet conduit, and a series of flues providing parallel passageways extending between said inlet and outlet conduits, each flue being of a cross section having one dimension substantially greater than the transverse dimension to form a large surface area compared to the 15 volume and in proximity to all portions of the burning gas stream and to thereby increase the

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transfer of heat from the burning gases to the liquid.

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REFERENCES CITED

The following references are of record in the file of this patent:

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