

G. ENGELBREKT.
 HEATER ELEMENT FOR HEAT ENGINE PLANTS AND EXPANSION FLUID MOTORS.
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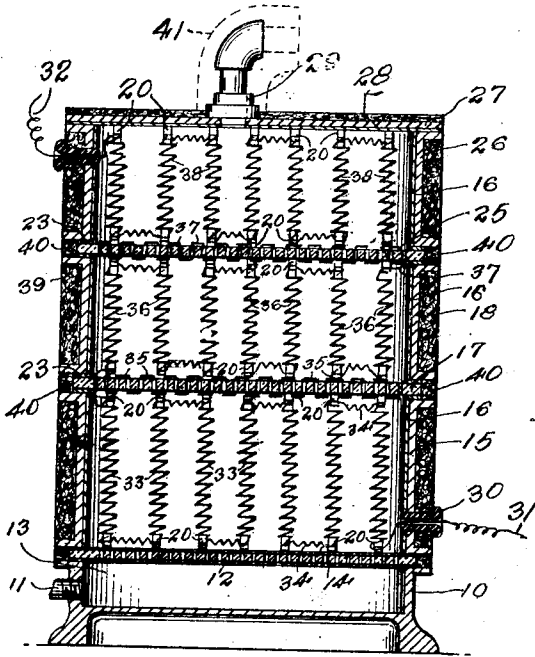


Fig. 1.

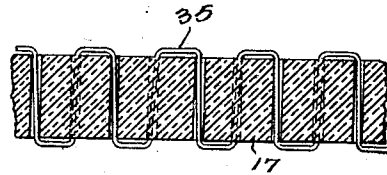


Fig. 3.

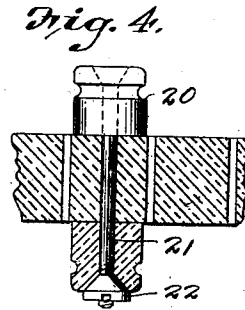


Fig. 4.

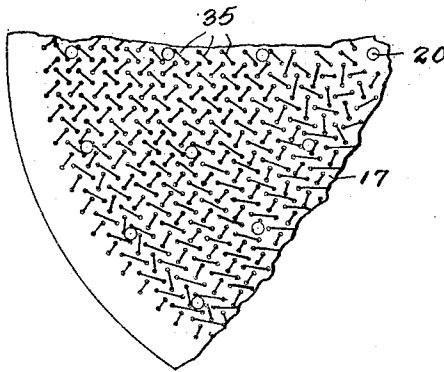


Fig. 2.

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HEATER ELEMENT FOR HEAT-ENGINE PLANTS AND EXPANSION-FLUID MOTORS.

1,297,814.

Specification of Letters Patent.

Patented Mar. 18, 1919.

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To all whom it may concern:

Be it known that I, GUSTAF ENGELBREKT, a citizen of the United States, residing at Superior, in the county of Douglas and State of Wisconsin, have invented certain new and useful Improvements in Heater Elements for Heat-Engine Plants and Expansion-Fluid Motors, of which the following is a specification.

The invention has for an object to effect an improvement in such devices whereby the rapid heating of air while being fed to a motor may be readily accomplished by means of electricity.

A further object is to effect an improvement in the specific structure of devices of this kind, and additional advantages and features of invention may be found in the arrangement and combination of parts hereinafter set forth, and shown in the drawings, wherein,

Figure 1 is a vertical sectional view of a heater constructed in accordance with my invention,

Fig. 2 is a fragmentary view of a heater element therefor,

Fig. 3 is an enlarged sectional view of a fragment of the heater element illustrated in Fig. 2,

Fig. 4 is a detail of the coil mounting for the device.

There is illustrated a heater element comprising a base 10 having a circular space therein open at its upper part, and provided with a flange upon which additional elements may be mounted and secured, this base having an air inlet at 11. Upon the base 10 there is secured a foraminate plate 12, serving as the top of the chamber 13 within the base 10, the plate 12 serving as a distributor for air admitted into the base in its passage upwardly into the heating chamber to be subsequently described. The plate 12 may be of metal or any other desired material, and is preferably covered by a suitable electric heat insulating material 14, if it is not itself made of such material. Upon the plate 12 there is superposed a cylindrical casing section 15, having flanges at its upper and lower ends corresponding to the flange on the base 10, its lower flange being secured to that of the base in any suitable manner. The section 15 is lined with insulating material 16, and supports a circular plate 17 of a suitable dielectric material. The plate or disk 17

is preferably composed of mica, or mica and asbestos or porcelain, and is of a diameter less than the major diameter of the flanges of the casing sections there being a heater section 18 superposed upon the plate 17, similar in form to the section 15, but of slightly less height as illustrated. Upon the upper side of the plate 12, a plurality of porcelain knobs 20 are mounted, at suitable intervals and upon the plate 17 similar knobs are secured on the upper and lower sides, as shown in Fig. 4, these knobs being preferably located in vertical alinement with those on the plate 12. The knobs upon the plate 17 may be secured by means of bolts 21, extending commonly through the plate and knobs on opposite sides of the plate, and each secured by means of a circular nut 22 countersunk in one of the knobs. In case the plate 17 is formed of a friable material, it is desirable to interpose between the plate and the casing section suitable gaskets 23. Upon the casing section 18 another plate 25, similar to the plate 17 is superposed, and correspondingly fitted with knobs 20 alined with those on the plate below, and upon the last mentioned plate a similar casing section 26 is positioned, the sections 18 and 26 being also lined with non-conducting material 16, and having gaskets 23 thereadjacent and next to the plate 25. Upon the top section 26 a plate 27 is secured, forming a head, and having thereunder a suitable body of insulating material 28. This plate 27 also carries knobs 20 alined with those below, and it is provided with an outlet fitting 29 for the passage of heated air.

In the lower casing section 15 a bushing is fitted, at one side, through which is led a wire 31 by which current may be carried to the heating units within the device, and in the upper section 26 of the casing a similar bushing is provided through which a wire 32 is extended, from the opposite end of the series of heating elements. Upon the knobs 20 within the section 15 of the casing a multiplicity of coils 33 are extended, between respective pairs of alined knobs, and these coils are connected in series, as illustrated diagrammatically at 34. The terminal of the series opposite the point of connection with the wire 31 is connected with a resistance wire 35, which is threaded tortuously through the plate 17, substantially as illustrated in Figs. 2 and 3, although the particular direction and pattern of the wire

as arranged upon the plate may be modified as found desirable to suit conditions involved. Within the casing section 18 a series of coils 36 is mounted in the same manner as the series 33 in the lower section, one terminal of the series being connected to the terminal of the wire 35, the opposite terminal of the series of coils being connected to a wire 37 threaded tortuously through the plate 25, in the same manner as the wire 35 is disposed in the plate 17, and the wire 37 is similarly connected to a series of coils 38 mounted upon the knobs 20 within the upper section 26 of the casing, which are connected in series with the lead wire 32.

The passages through the plates 17 and 25 are made as small as practicable, having consideration for the size of the wires threaded therethrough, and are located as close together as practicable for the purposes desired. It is the object to provide an extremely small clearance between the sides of the openings and the wire threaded therethrough, so that air passing through the plate is sub-divided or formed into a very thin film while passing the heating wire, thus insuring the rapid and efficient heating of the air passing through the device. It may be found desirable to increase the number of sections, or to decrease them, and it is thought probable that the two plates illustrated will be found amply sufficient. In the illustrations, for convenience in drawing, the apertures have been shown somewhat farther apart than they would be in practice.

By reason of the fact that the wires 35 and 37 are in direct contact with the supporting plates, the plates themselves become highly heated, and aid considerably in transference of heat to the air passing therethrough. The sides of the casing sections may be covered with heat insulating material 39, and by forming the plates 17 and 25 of smaller diameter than the flanges of the casing sections, a space is provided in which heat insulating material may be introduced, as at 40. The outlet 29 and any conducting pipe leading from the heater, should, of course, also be covered with heat insulating material, as dotted at 41.

What is claimed:

A heater of the character described comprising a casing element, one or more foraminated plates dividing the casing, means to admit air at one side of the plates, means to conduct air from the casing at the opposite side of the plates, a heating wire threaded through the foramens of the plate, said foramens and wire being of such relative size as to provide an extremely small passage, whereby air passing therethrough will be formed into an extremely thin film between the sides of the foramens and wire in intimate contact with the heating wire; and exterior electrical terminals for the heating wire.

In testimony whereof I have affixed my signature.

GUSTAF ENGELBREKT.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."