April 21, 1936. V. C. NORQUIST 2,037,998

HAIR DRYING APPARATUS

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Fig. 1.

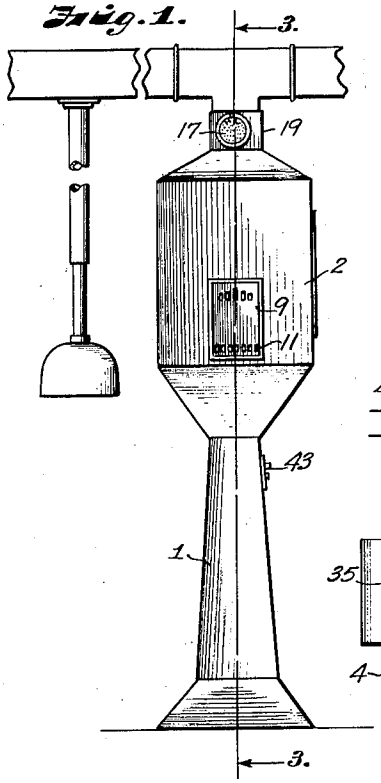


Fig. 12.

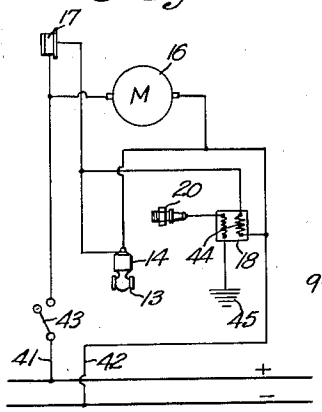


Fig. 2.

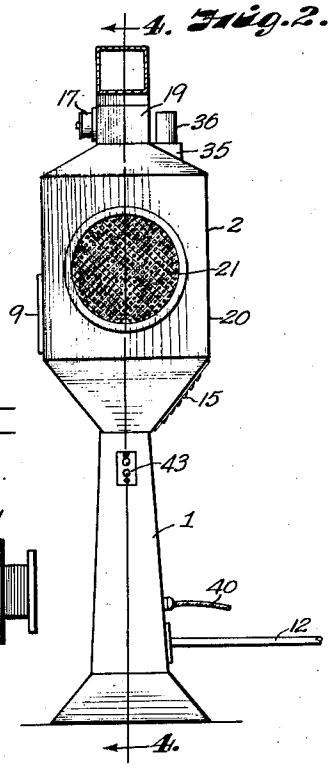


Fig. 8.

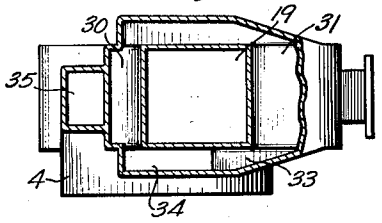


Fig. 6.

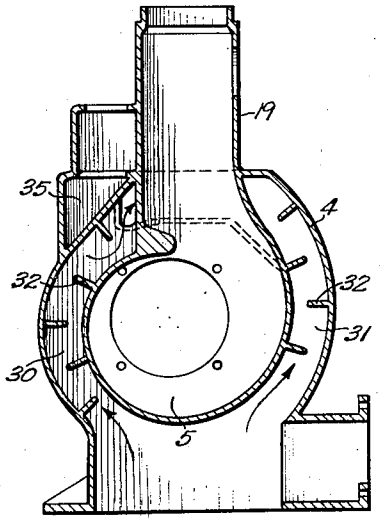


Fig. 5.

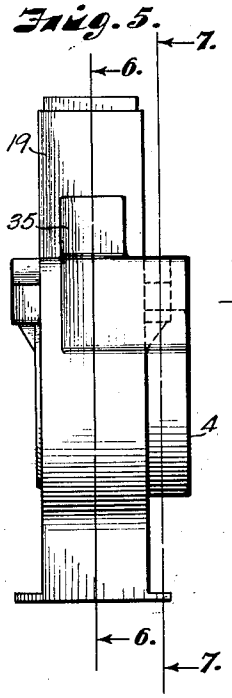
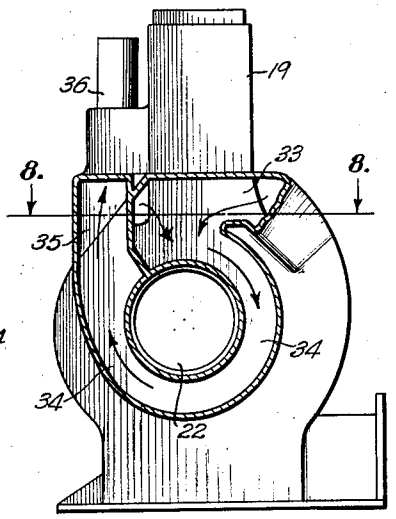


Fig. 7.



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Fig. 3.

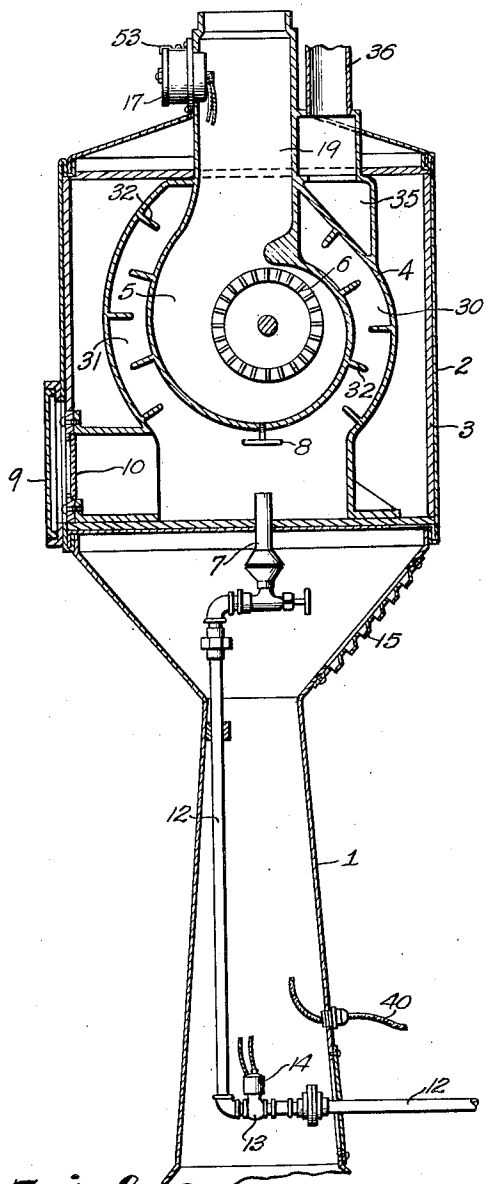


Fig. 4.

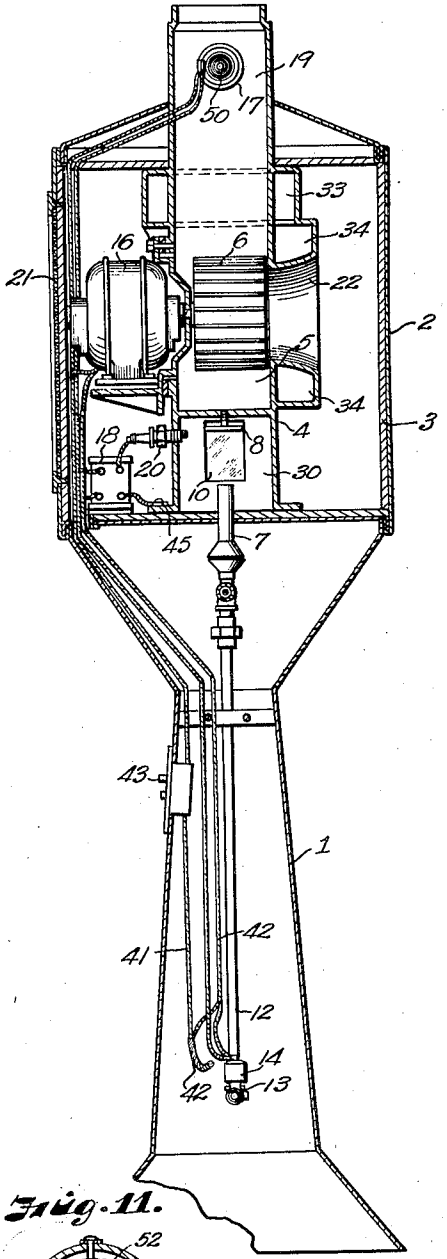


Fig. 9.

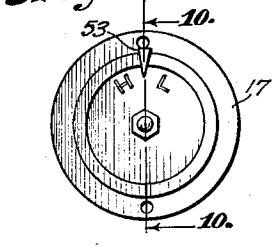


Fig. 10.

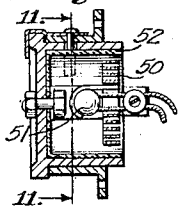
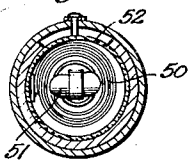


Fig. 11.



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UNITED STATES PATENT OFFICE

2,037,998

HAIR DRYING APPARATUS

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Application March 2, 1933, Serial No. 659,250

2 Claims. (Cl. 126—110)

My invention relates to a hair drying apparatus and more particularly to a hot air generator which forms the central source of heated air for a plurality of individual hair drying helmets.

In beauty parlors at present, when it is desired to dry hair, individual hair driers are used which are provided with electric heating elements. These individual hair driers are expensive and are, furthermore, very inefficient in their operation. When the devices are turned on, a considerable time interval must elapse before the temperature required to heat the air is reached, thus consuming both time and electricity. The individual hair driers constituting separate sources of heat, result in an objectionably increased temperature, especially during warm weather.

One object of my invention is to provide a hair drying apparatus in which a plurality of hair drying helmets may be used simultaneously with a central source of hot air.

Another object of my invention is to provide an economical and efficient means of generating and supplying hot air.

A further object of my invention is to provide a hot air generator which may be of general utility and may be used for heating homes and for other purposes in which hot air is required.

Further objects of my invention will appear from the following description.

This application is a continuation in part of my copending application, Serial No. 645,249, filed December 1, 1932.

In the accompanying drawings which form part of the instant specification and which are to be read in conjunction therewith and in which like reference numerals are used to indicate like parts in the various views;

Figure 1 is an elevation of my hot air generator connected to a portion of the hair drying system.

Figure 2 is a side elevation of my hot air generator.

Figure 3 is a sectional view taken on the line 3—3 of Figure 1.

Figure 4 is a sectional view taken on the line 4—4 of Figure 2.

Figure 5 is a side elevation of the cochleate heat exchange member.

Figure 6 is a sectional view taken on the line 6—6 of Figure 5.

Figure 7 is a sectional view taken on the line 7—7 of Figure 5.

Figure 8 is a sectional view taken on the line 8—8 of Figure 7.

Figure 9 is a front elevation of the thermostatic heat control element.

Figure 10 is a sectional view taken on the line 10—10 of Figure 9.

Figure 11 is a sectional view taken on the line 11—11 of Figure 10.

Figure 12 is a diagrammatic view of the electric connections of my hot air generator.

In general, my invention contemplates the provision of a gas fired burner discharging the products of combustion through a cochleate or anfractuous passageway providing an elongated heat exchange surface. The twisting passageway is formed within a casting which is provided with a chamber adapted to house a centrifugal blower fan and discharge air through a straight passageway running through the heat exchange member. The air in passing through the member will become heated by heat exchange. The construction is such that a large amount of heat exchange surface is provided. The casting is positioned in a casing with an air inlet to the heat exchange member so positioned that the incoming air to the casing will pass around the exterior of the casting. This will serve to preliminarily heat the air entering the heat exchange member and, at the same time, prevent the radiation of heat into the space occupied by the generator. I provide a thermostatic control element which governs a circuit including a valve which governs a gas supply to the burner, as well as a transformer to insure that the gas will always be ignited while the valve is open and the blower running.

More particularly referring now to the drawings, a standard 1 of any suitable shape forms a pedestal-like support for a casing 2. The casing is provided with insulating material 3 and houses a heat exchange member 4. The heat exchange member comprises a casting which is formed with a cochleate passageway which will be more fully described hereinafter. In the center of the casting 4 an enlarged chamber 5 is provided, in which a blower fan 6 is positioned. This can be readily seen by reference to Figure 3 and it will be observed that the arrangement is such as to form a centrifugal air blower. The heat is supplied by a Bunsen burner 7 which discharges its flame into the cochleate passageway. I provide a baffle plate 8 immediately above the burner to deflect the products of combustion so that they will travel through both branches of the anfractuous passageway. The casing 2 is provided with an opening furnished with a cover plate 9 giving access to glass or mica insert 10. The cover plate

9 is provided with suitable openings 11 through which the flame issuing from the burner 7 may be observed from the exterior of the casing. The gas to the burner 7 is supplied through pipe 12 which is controlled by valve 13. Valve 13 is operated by a solenoid 14 as will be more fully described hereinafter. The pedestal is formed with louver openings 15 to admit air to support the combustion of the gas in the burner 7. The blower fan 6 is driven by an electric motor 16 in the circuit of which is interposed a thermostat 17 to transformer 18. The thermostatic element 17 is interposed in a passageway 19 through which the heated air from the heat exchanger member 4 is thrown by blower 6. The secondary coil of the transformer 18 is connected to a spark plug 20 positioned immediately above the burner 7 to insure that the flame is always lit to avoid the danger of escaping gas. The casing 2 is provided with a large opening covered by a screen 21. The air to be heated enters the casing through screen 21 and must pass around the exterior of the heat exchange member to the opening 22 thereof leading to the blower fan 6.

The heat exchange member 2 is shown in detail in Figures 5, 6, 7, and 8. The flame issuing from burner 7 is split into two parts by the baffle plate 8 and passes up branch passages 30 and 31 as can be seen by reference to Figures 3 and 6. These passages are provided with baffle members 32 to lengthen the path of the hot products of combustion. The gases meet at the top of the heat exchange member and cross over through passage 33, and are redirected through annular passageway 34 as can be seen in Figure 7. The gases, after passing through passageway 34, cross over through passageway 35 and emerge through flue pipe 36 from which they are discharged to the atmosphere. It will be observed by reference to Figure 4 that passageway 34 surrounds the blower inlet 22 while passageways 31 and 30 surround the blower fan housing. The direction of the flow of hot gases to the flow of the air to be heated is substantially counterflow relation. The extremely long path of hot gas flow results in a heat exchange of high order. In practice, the difference between the temperature of the flue gases and the temperature of the air heated is but a few degrees indicating a very efficient heat exchange. The heat exchange member, furthermore, is extremely compact and accompanies a very small space. In describing the peculiar arrangement of the passageways, I prefer to use the term "cochleate" or "anfractuous". It is to be understood, of course, that other cochleate or anfractuous passageways of slightly different forms are within the scope of my invention. The air, after entering opening 22 is whirled around chamber 5 with increasing speed and is discharged through the straight passageway 19.

Referring now to Figure 12 in which the electrical connections are shown diagrammatically, the conductor cable 40 comprises lead wires 41 and 42 connected to any suitable source of potential. The switch 43 closes the circuit through thermostat 17. It will be observed that the closing of the switch 43 at once places the motor 16 across the line so that it will run at all times while the switch 43 is closed. The thermostat is in series with solenoid 14 which, as was pointed out hereinbefore, controls valve 13 of the gas supply. The primary 44 of transformer 18 is also in series with the thermostat 17. The secondary of the transformer 18 is connected to the spark plug 20 as was hereinbefore described. One electrode of the spark plug is grounded and the other end of the secondary is also grounded at 45. It will be obvious, therefore, that, if the temperature of the hot air is below a predetermined point so that the circuit through the thermostat is closed, the solenoid 14 will open the gas supply and will spark the spark plug 20 igniting the flame. The thermostat 17 may be of any suitable construction. I prefer to use the one shown in Figures 9, 10, and 11 which consists of a spiral metallic member 50 carrying a mercury switch 51. The initial position of the mercury switch 51 may be adjusted by rotating the housing 52 which carries the assembly. A pointer 53 shows the position of the mercury switch, the indication "H" meaning high and the indication "L" meaning low.

In operation, when it is desired to obtain hot air from my generator, the switch 43 is closed. Inasmuch as the air will be of such temperature that the thermostat 17 will be closed, this will supply gas to the burner 7 which will be lit by the spark from plug 20. The motor will drive the blower 6 which will take air through screen 21 and blow it through the heat exchange member. The hot products of combustion from the burner 7 will take the path through the anfractuous passageway described hereinbefore. The air will become heated and be taken from passageway 19 and used for any suitable purpose. The flue gases will be withdrawn through flow pipe 36. Should the temperature of the air exceed a predetermined amount, the thermostat 17 will interrupt the circuit which will permit valve 14 to close. The motor will keep running until the temperature of the air reaches the predetermined low point, when the thermostat will again close a circuit through solenoid 14, thus opening valve 13, and at the same time, causing a spark to issue from plug 20 to light the gas.

It will be understood that certain features and sub-combinations are of utility and may be employed without reference to other features and sub-combinations. This is contemplated by and is within the scope of my claims. It is further obvious that various changes may be made in details within the scope of my claims without departing from the spirit of my invention. It is, therefore, to be understood that my invention is not to be limited to the specific details shown and described.

Having thus described my invention, what I claim is:

1. A hot air generator comprising in combination a casing, a heat exchange member mounted within said casing in spaced relation thereto, said member being formed with air and gas passages in heat exchange relation, a fuel burner arranged to discharge gases of combustion into said gas passage, a blower within said air passage to blow air therethrough, outlet ducts for said air and gas passages extending exteriorly of the casing, an air inlet to said casing, and an air inlet to the air passage in said heat exchanger, said last air inlet facing away from the air inlet to the casing whereby the air passing into the casing must pass around the exterior of the heat exchange member before entering the air inlet thereof.

2. A hot air generator as defined in claim 1, wherein the outlet duct for the gas passage has a portion thereof in heat exchange relation to the air inlet in said heat exchange member.

VICTOR C. NORQUIST.