

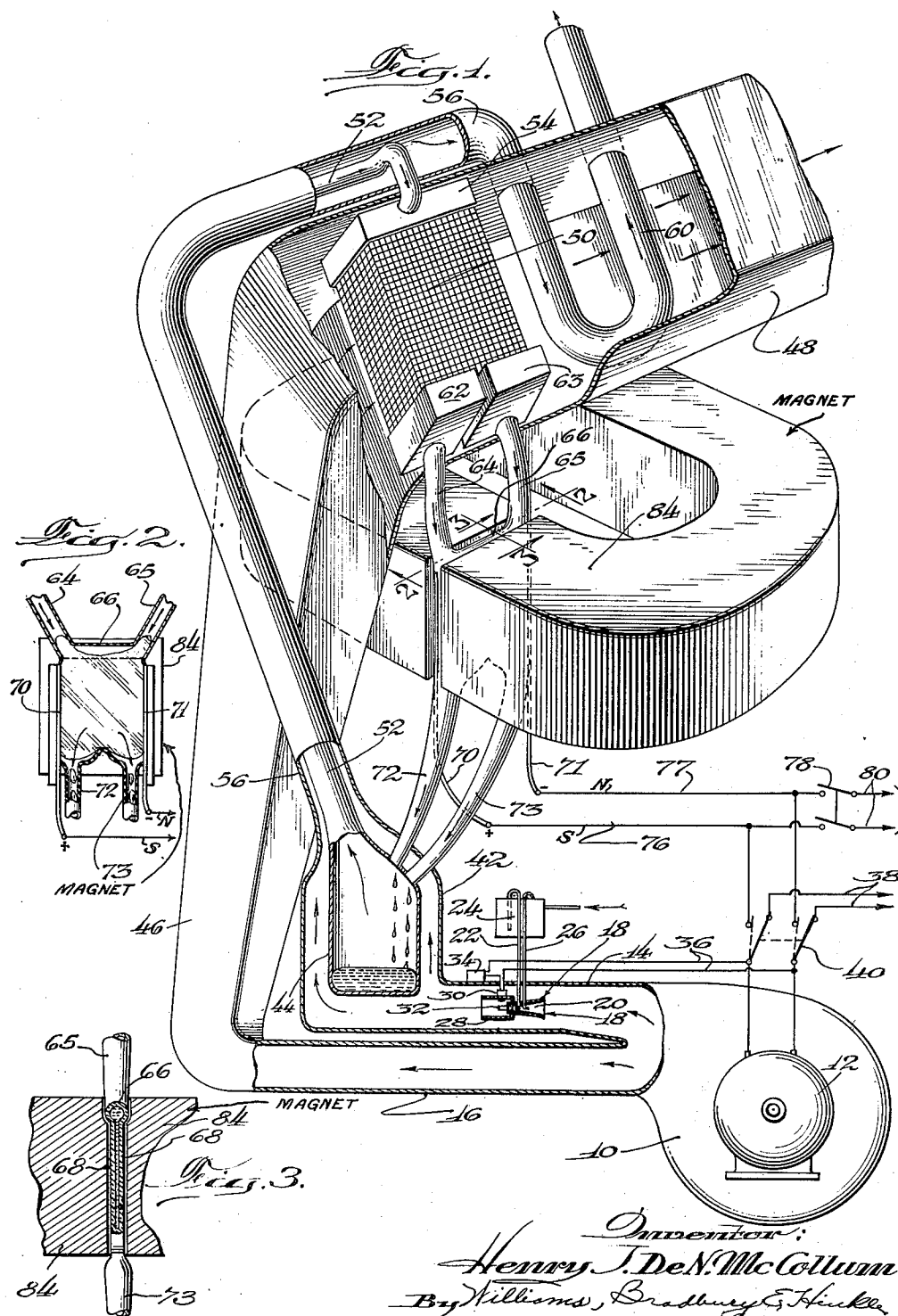
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HEATING AND ELECTRICAL GENERATING APPARATUS

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HEATING AND ELECTRICAL GENERATING
APPARATUS

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5 Claims. (Cl. 171-212)

My invention relates generally to heating and electrical generating apparatus, and more particularly to improved means for converting a portion of the heat provided by heating apparatus into electrical energy for the operation of electrical appurtenances to the heating system.

It is an object of my invention to provide an improved heating system employing an improved thermoelectric generating apparatus of improved form.

A further object of my invention is to provide an improved heating and electrical generating system which will be capable of supplying electrical energy for the operation of appurtenances to the apparatus and also for other purposes.

Other objects will appear from the following description, reference being had to the accompanying drawing, in which:

Fig. 1 is a perspective view of the apparatus, portions thereof being shown in fragmentary section;

Fig. 2 is a fragmentary sectional view taken on the line 2-2 of Fig. 1; and,

Fig. 3 is a fragmentary sectional view taken on the line 3-3 of Fig. 1.

Referring particularly to Fig. 1, the heating apparatus of my invention comprises a blower 10 driven by an electric motor 12 and supplying air under pressure to a pair of conduits 14 and 16. Within the conduit 14 is a burner tube 18 including a Venturi-shaped induction passage 20, to which liquid fuel, such as gasoline, is supplied through a tube 22 from a float bowl or reservoir 24, pressure being maintained within the reservoir 24 by virtue of a tube 26. The burner tube 20 thus is capable of supplying a combustible mixture of fuel and air to a combustion chamber 28, which is provided with an electric igniter 30 and a suitable reigniter 32.

This heating apparatus may be of the general type disclosed in my copending application Serial No. 436,090, filed March 25, 1942, and may include a reigniter of the type more fully disclosed in my copending application Serial No. 410,039, filed September 8, 1941.

The electrical igniter 30 is connected in a series with a thermostatic switch 34 supplied with current through conductors 36 connecting the igniter in parallel with the electric motor 12. Both the electric motor 12 and electrical igniter 30 may be initially supplied with current from line conductors 38 by a double-pole double-throw switch 40 when the latter is moved to its full-line position. The products of combustion from the heater, and any secondary air heated thereby, 55

flow from the conduit 14 into a boiler chamber 42, which contains a mercury boiler 44. The conduit 16 connects with a duct 46, which is enlarged to provide a ventilating air duct 48 within which is located a heat exchanger 50 of any suitable construction, such, for example, as a finned tubular type. The mercury from the boiler 44 flows through a pipe 52 to the upper header 54 of the heat exchanger 50. The pipe 52 is jacketed by a stack pipe 56 which extends beyond the upper end of the pipe 52 and preferably passes through a duct 48 in one or more loops 60 to supply heat to the air passing through the duct. The stack pipe may discharge into the atmosphere through any suitable conduit. The duct 48 is connected to a space to be supplied with heated air.

The lower end of the heat exchanger 50 is provided with a pair of separated headers 62, 63 for collecting mercury condensed in the heat exchanger 50, the collected mercury flowing from the headers 62 and 63 through conduits 64 and 65, respectively. The headers 62 and 63 and the conduits 64 and 65 preferably are made of a suitable insulating material, such as glass. The discharge tubes 64, 65 are joined by a transverse tubular collector 66, which is likewise of insulating material and is secured to or formed integrally with a pair of sheets or plates 68, which are secured together in closely spaced relation so as to cause the mercury flowing downwardly between them to assume a very thin sheet-like form. At the vertical edges of the sheets 68 there is a pair of strips 70, 71, of conducting material, the edges of which are adapted to be in contact with the sheet of mercury flowing between the insulating sheets 68.

The mercury flowing downwardly between the sheets 68 is divided into two portions to flow through separate return pipes 72, 73 to the boiler 44. The return pipes 72, 73 are preferably of such large diameter that the mercury will not flow therethrough in continuous streams, but will, due to surface tension effects, separate into small globules which will drop separately into the pool of mercury within the boiler 44. The strips 70, 71 form electrodes and are connected, respectively, to output conductors 80, which, upon operation of the switch 40 to its dotted line position, are connected to the motor 12 and the conductors 36.

The sheets 68, as well as the collector tube 66, lie between the ends of the north and south poles of a magnet 84, which is preferably a permanent magnet capable of producing a high flux density between the ends of its poles, and which will

retain its magnetism for a long period of time. A permanent magnet made of Alnico or similar material may be used.

In starting the apparatus, the operator will first move the switch 40 to its full-line position, thereby energizing the motor 12 and the electrical igniter 30. The flow of air through the Venturi induction tube 20 will create a differential pressure between the ends of the tubes 22 and 26, and as a result, fuel will be forced from the float bowl or reservoir 24 into the induction tube which will serve as a carburetor to atomize the fuel as it flows into the combustion chamber 28. In the combustion chamber, the fuel mixture will be ignited and the products of combustion more or less diluted by the secondary air which flows around the combustion chamber to the furnace chamber 42 to vaporize the mercury in the furnace 44.

The vaporized mercury will flow from the boiler 44 upwardly through the pipe 52 to the condenser heat exchanger 50. Condensation in the pipe 52 will be prevented by the fact that this pipe is jacketed by the stack pipe 56. The mercury vapor will, of course, condense in the heat exchanger 50 and flow into the separate insulated headers 62, 63 and ducts 64, 65 to the collector tube 66, which will permit the mercury to flow in a thin sheet between the insulating plates 68, the edges of the mercury sheet being in contact with the electrode strips 70, 71. Due to the fact that the sheet of mercury between the plates 68 is moving in a dense magnetic field, a potential will be built up between the electrodes 70, 71 and electrical current generated. This current may be utilized to supply the energy for the operation of the motor 12, after normal operation of the system has been attained, by moving the switch 40 to the dotted-line position.

As previously stated, the blower 10 also supplies air through the conduit 16 and ducts 46, 48 to cool the mercury vapor in the condenser heat exchanger 50 and passes over the looped extension of pipe 56. The air flowing from the duct 48 will thus have derived substantially all of the heat available from the combustion of the fuel, and the air will be heated to a temperature useful for various heating purposes.

After the apparatus has been in operation for some time, any electrical energy generated in excess of that required for the operation of the motor 12 may be utilized for other purposes by closure of the switch 78.

The apparatus is preferably so designed that the mercury is not substantially superheated as it enters the header 54 of the condenser 50, with the result that it will condense very rapidly in this condenser and flow therefrom in liquid form at a sufficiently high rate to maintain the flow of a sheet of mercury between the plates 68 at high velocity.

The apparatus is preferably made self-regulating by limiting the amount of mercury in the system, so that, should the supply of heat to the boiler 44 increase substantially beyond normal, it will result merely in the evaporation of all of the mercury contained therein, and the head of mercury within the collector headers 62, 63 and conduits 64, 65 will build up to increase the rate at which the mercury flows between the plates 68. The operation of the apparatus may be stopped merely by the cutting off of the supply of fuel, or by moving the switch 40 to a position intermediate the full and dotted-line positions.

While I have shown and described a particular

embodiment of the invention, it will be apparent to those skilled in the art that numerous modifications and variations may be made therein without departing from the underlying principles of the invention. I therefore desire, by the following claims, to include within the scope of my invention all such modifications and variations by which substantially the results of my invention may be obtained by the use of substantially the same or equivalent means.

I claim:

1. In a heating and electrical generating system, the combination of a mercury boiler, a fuel burner, a blower for supplying combustion air to said burner, fuel supply means for said burner, means for igniting said fuel in said burner and supplying the heated products of combustion to said boiler, a mercury vapor condenser connected to said boiler to receive vaporized mercury therefrom, a conduit for conveying cooling air from said blower to said condenser, a magnet having closely spaced poles, means for conducting liquid mercury from said condenser to said boiler in the form of a thin sheet passing between the poles of said magnet, and a pair of electrodes in contact with the edges of the sheet of mercury for conducting the generated current therefrom.

2. In a heating and electrical generating apparatus, the combination of a fuel burner, electric motor driven blower means for supplying air for combustion in said burner, means for utilizing the heat of combustion to vaporize a quantity of mercury, means at a higher elevation than said vaporizing means for condensing the mercury vaporized thereby, a magnet, conduit means located between the pole faces of said magnet and conformed to cause liquid mercury condensed in said last named means to flow in a thin sheet between the pole faces of said magnet, and electrodes making contact with the sheet of mercury and forming part of said conduit means.

3. In a heating and electrical generating system, which includes a source of air under pressure, the combination of a mercury boiler, a fuel burner, fuel supply means for said burner, means for igniting said fuel in said burner and supplying the heated products of combustion to said boiler, a mercury vapor condenser connected to said boiler to receive vaporized mercury therefrom, a conduit for conveying cooling air from said source to said condenser, a magnet having closely spaced poles, means for conducting liquid mercury from said condenser to said boiler in the form of a thin sheet passing between the poles of said magnet, and conductors along the edges of said means.

4. In a heating and electrical generating apparatus, the combination of a fuel burner, an electric motor, a blower driven thereby for supplying air for combustion in said burner, means for utilizing the heat of combustion in said fuel burner to vaporize a quantity of mercury, means at a higher elevation than said vaporizing means for condensing the mercury vaporized thereby, a magnet, conduit means located between the pole faces of said magnet and conformed to cause flow of liquid mercury condensed in said last named means to flow in a thin sheet between the pole faces of said magnet, electrodes along the edges of said conduit means, and conductors for connecting said electrodes to said motor.

5. In a heating and electrical generating system, the combination of a mercury boiler, a fuel burner, a blower for supplying combustion air to said burner, fuel supply means for said burner,

2,362,283

3

means for igniting said fuel in said burner and supplying the heated products of combustion to said boiler, a mercury vapor condenser located at a higher elevation than said boiler and connected thereto for receiving vaporized mercury therefrom, a conduit for conveying cooling air from said blower to said condenser to be heated

thereby, means forming a dense magnetic field and having closely spaced poles, means for conducting liquid mercury from said condenser to said boiler in the form of a thin sheet passing between said poles, and electrodes extending 5 along the edge of said sheet of mercury.

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