CHAPTER 19

Burner Radiant Heat Control

According to Kennedy Van Saun: *"It is agreed by those who are familiar with combustion that radiant heat is most desirable and that it is about eight times as good as heat by convection in the combustion chambers."**

Some of the burner manufacturers appreciating the efficiency of heat transmission by radiation have utilized radiant heat for the automatic control of their burners, calling it "electric eye" visaflame, sometimes erroneously electronic control, and what not of a non-descript or questionable nature.

Ques. Why do they call it electric eye?

Ans. Because it works when it can "see" the flame.

Ques. How do they utilize radiant heat for burner control?

Ans. The device used is a hermetically sealed glass bulb

*NOTE.—Anyone even a ***thermal dumb-bell*** who doubts this, need only open up the bathing season by spending two or three hours on the beach under the blazing sun and experience the usual results the next day—***sunburn***.

(similar to an electric light bulb, but containing a thermo-mercury switch) whose operation depends on the concentration of radiant heat and unequal expansion of a bimetal element.

Ques. Describe its make up and operation.

Ans. Fig. 1 shows the bulb and its parts and fig. 2, illustrates principle of operation. *In operation,* as the light passes through the front side of the glass bulb, it is intercepted on the other

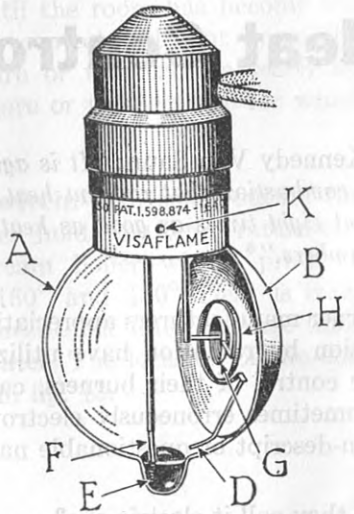

Fig. 1—Burner radiant heat control bimetal coil bulb, as described in the text.

side by the concave mirrored reflector **B**, which in turn concentrates these light waves on the small bimetal coil **G**. Since this coil is not transparent, but opaque, it transmits the light waves into heat and causes the coil to expand, that is, move in an openward direction, carrying the movable electrode **D**, into the pool of mercury **E**.

Ques. Why does the heat cause the coil to move?

Ans. It is due to unequal expansion of the two dissimilar metals of which it is composed.

Ques. What is the result of the movement of the coil?

Ans. When the movable electrode **D**, contacts with the pool of mercury **E**, it closes the circuit between the fixed electrode **F**, and the movable electrode **D**.

Ques. As for further explanation, what can the action of the concave reflector **B**, be compared?

Ans. It may be compared to a sun glass which concentrates light rays from the sun on a small area. The concentrated rays greatly increasing the temperature on the small area, as compared with the temperature that would exist if the light followed a straight path and covered a large opaque area.

Due to the fact that only the small sensitive coil is subjected to the concentrated light, it reaches a temperature in excess of its surrounding or ambient temperature and responds quickly to actuate the contact mechanism to close the circuit.

Ques. How long does the circuit remain closed?

Ans. It remains closed until the concentrated light disappears, the contact mechanism responding quickly to actuate the contact mechanism to open the circuit.

In other words, when the bimetal coil or "eye" of the device can "*see*" the flame, (that is, when the flame comes on) it *heats up* and closes the circuit. Again, when it cannot "see" the flame (that is, when the flame goes out) it *cools off* and opens the circuit.

Ques. What provision is made to compensate for changes in ambient temperature, that is, changes in temperature surrounding the bimetail coil?

Ans. A large outer compensating bimetal coil **H**, is provided.

Ques. How does it work?

Ans. As ambient temperature changes occur, both bimetal coils are equally affected. As a result of this compensation, the movable electrode **D**, does not change its position regardless of whether the ambient temperature increases or decreases.

Ques. When the burner stops after prolonged operation and the bricks of the combustion chamber are close to white heat, what are the effects of this incandescence?

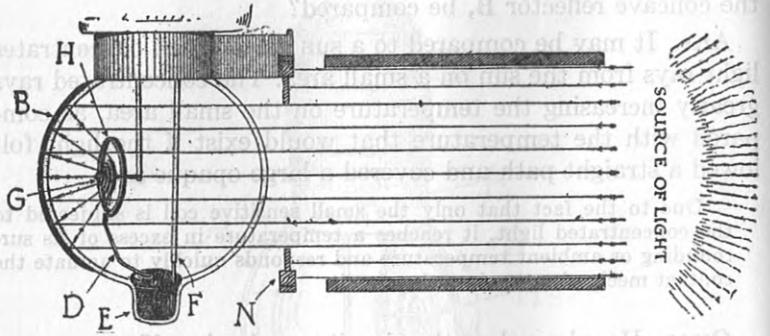

FIG. 2—Bimetal coil bulb showing parts and principle of operation.

Ans. The walls of the combustion chamber are more remote from the bimetal coil than the flame. Accordingly, since the intensity of light varies as the square of the distance, the light due to the incandescence is not as intense as the light produced by the flame, hence after the burner shuts down, the light due to incandescence is of relatively low intensity and will have little or no effect on the bimetal coil.

Ques. Name two control units designed to operate with the radiant heat control bulb?

Ans. A combination transformer relay and a safety mechanism.

Ques. Describe the transformer-relay unit.

Ans. It consists of two independent insulated heavy duty coils which are mounted on a laminated iron yoke. The primary coil is fixed in position and is connected across the high voltage line. The secondary coil is movable and is connected to the low voltage thermostat circuit.

Ques. How do these two coils act?

Ans. As a transformer, the low voltage is induced in the secondary coil when the primary is energized.

Ques. What causes the device to function as a relay?

Ans. It is due to repulsion action. When the low voltage thermostat closes its circuit, the secondary coil moves upward and closes the mercury switch contact and starts the burner motor.

Ques. What is the function of the safety mechanism?

Ans. It determines the period the burner shall operate without flame.

Ques. Of what does it consist?

Ans. It consists of a low voltage heater coil combined with a bimetal thermostatic strip.

Ques. How does it work?

Ans. It acts as a tripping device to shut down the burner in case of flame or ignition failure.

Ques. For what kind of ignition are the above units adopted?

Ans. For either intermittent or constant ignition.

Ques. What other "tube" method may be used for burner control?

Ans. By employing electronic circuits it is possible to detect the presence or absence of flame.

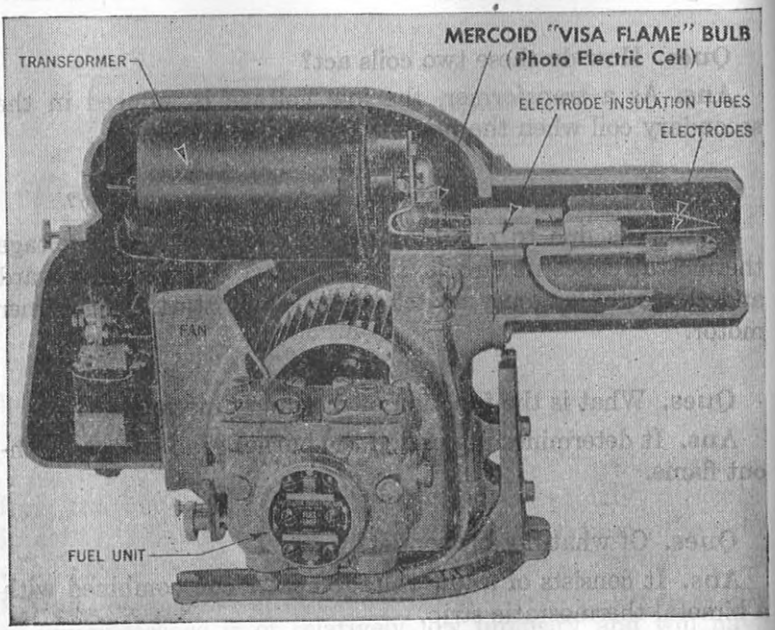

FIG. 3.—Herco oil burner. Sectional view showing "visaflame" control. The light actuated visaflame bulb is mounted inside the burner directly on the hinged transformer as shown. Wiring between visaflame bulb and relay panel is fully enclosed.