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H. F. ALFERY

2,305,585

THERMOCOUPLE AND PILOT BURNER

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Fig. 1.

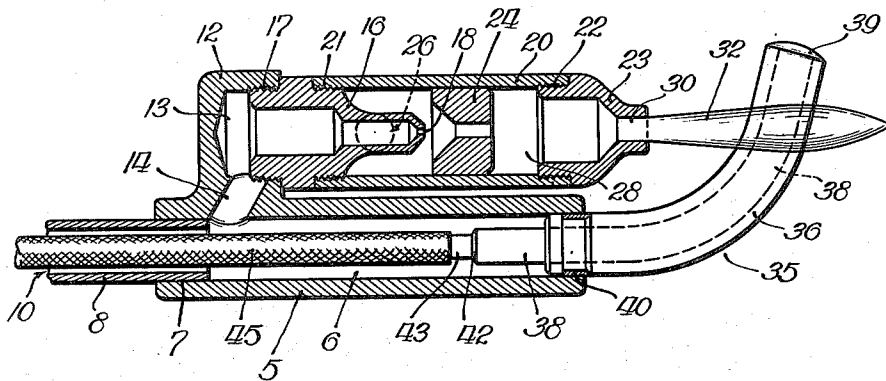


Fig. 2.

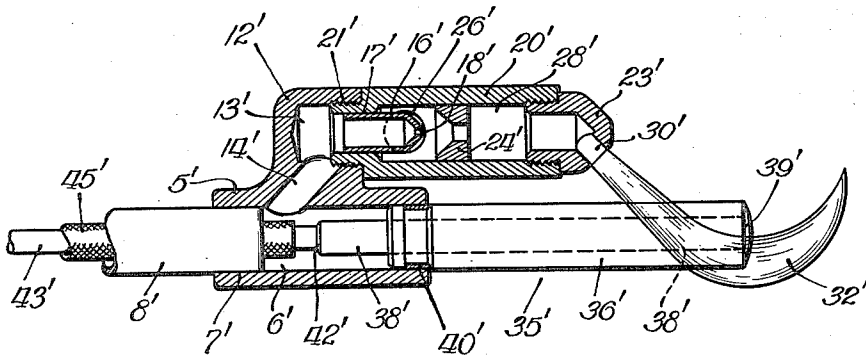
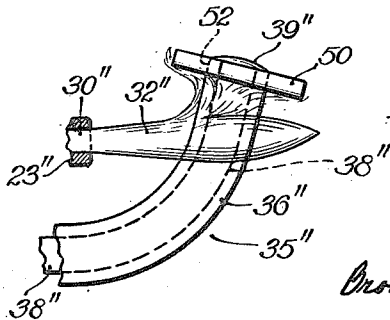


Fig. 3.



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THERMOCOUPLE AND PILOT BURNER

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10 Claims. (Cl. 136-4)

This invention relates to a thermocouple and pilot burner.

One of the main objects of the invention is to provide a combined thermocouple and pilot burner which is effective and reliable in operation and, at the same time, is simple and compact in construction and relatively inexpensive to build, assemble, and install.

Another object of the invention is to provide an improved form of thermocouple; also a thermocouple provided with an extended fin in juxtaposition to the thermal junction which is adapted to be heated for the purpose of increasing the amount of heat transmitted to this junction and thereby increasing the voltage of the thermo-electric current generated by the heating of the thermocouple.

It is also an object of the invention to provide a thermocouple and pilot burner as a unitary assembly that may be mounted as a unit, and in which the desired position of the thermocouple relative to the pilot flame is at all times assured; also a device of the character set forth having an improved relation and improved forms of connection between the various parts.

Further objects and advantages of the invention will appear from the following detailed description, taken in connection with the accompanying drawing, in which:

Figure 1 is a detail longitudinal section through a combined thermocouple and pilot burner embodying the present invention;

Figure 2 is a similar section through another embodiment of the invention; and

Figure 3 is a fragmentary view of the thermocouple shown in Figure 1, showing the same provided with an extended fin in juxtaposition to the thermal junction which is adapted to be heated for a purpose which will hereinafter appear.

Referring now in detail to the drawing, the embodiment of the invention shown in Figure 1 comprises a metallic body member 5 having a passage 6 extending longitudinally therethrough.

Secured at 7 in one end of the body member 5 is an external metallic tubular lead member 8. The lead member 8 may be connected, for example, in circuit with one side of the electromagnet of a safety control device of the general character disclosed in John H. Thornbery and Harold A. Mantz Patent No. 2,126,587, granted August 9, 1938, or it may be connected in circuit with any other suitable or preferred device. The lead member 8 with the metallic body member 5 constitute a lead conductor between one side of

the electromagnet and the external thermocouple element.

The interior of the lead member 8 forms a gas or fuel way 10 through which the gas or other suitable fuel is conducted to the pilot burner. The interior of the lead chamber 8 is suitably connected with the fuel supply line as shown, for example, in the Patent 2,189,829 to Guido Wunsch and Josef Schuppert granted February 13, 1940; also in the Patent 2,271,506 to Harold A. Mantz granted January 27, 1942; and in the Patent 2,198,896 to Theodore A. Wetzel granted April 30, 1940, or in any other suitable or preferred manner.

The interior fuel supply way 10 of the lead 8 opens into one end of the passage 6 and at the adjacent end the body member 5 has a laterally extending portion 12, the interior 13 of which is supplied with fuel through a passage or port 14 leading from the passage 6 adjacent the end of the lead member 8.

A nozzle or jet member 16 is screwed at 17 into the laterally extending portion 12 of the body member 5, and the fuel passes therethrough and outwardly through the orifice or port 18 at the outer end of the jet member. A sleeve 20 is screwed onto the nozzle or jet member 16 at 21, and screwed at 22 into the outer end of the sleeve 20 is a second nozzle or jet member 23. The jet members 16 and 23 are thus disposed in coaxial spaced relation. A venturi member 24 may be fixed, if desired, in the sleeve 20 between the jet members 16 and 23, although its use is not essential.

Where the fuel is of a character, such as gas, requiring admixture of air therewith, the air necessary to provide the desired gaseous mixture is admitted through an air inlet opening laterally through the sleeve 20 as shown in dotted lines at 26. The air admitted through the inlet 26 and the fuel that issues from the orifice or port 18 pass outwardly through the venturi 24 into the mixing chamber 20. The resulting gaseous mixture issues outwardly through the port 30 at the outer end of the jet member 23 and, when ignited, forms the pilot flame indicated at 32.

The thermocouple, indicated in its entirety at 35, comprises an external metallic tubular thermocouple element 36 of curved or angular form and an internal metallic thermocouple element 38 of dissimilar material disposed within the external element 36 and of corresponding curved or angular form. The outer end of the internal thermocouple element 38 is joined to the outer

end of the external thermocouple element 36 to form a thermal junction at 39 which is adapted to be heated by the pilot flame 32.

The opposite end of the external thermocouple element 36 is brazed, welded, or otherwise suitably secured at 40 in the outer end of the body member 5 in axial alignment with the lead member 8. The inner end of the internal thermocouple element 38 extends from the inner end of the external element 36 and into the passageway 6, where it is joined at 42 to the bared end of an internal lead conductor 43 to form an internal cold thermal junction. The attachment of the inner end of the external element 36 to the body member at 40 forms a second cold thermal junction.

The internal lead conductor 43, which is preferably covered with insulation as indicated at 45, extends through the lead member 8 preferably to the position where it is connected in circuit with the other side of the electromagnet of the safety control or other device. The metallic body member 5 constitutes not only a thermo-electric current conducting connection between the external thermocouple element 36 and the external metallic tubular lead member 8, but also forms an enclosure about the internal thermal junction 42. The internal thermal junction 42 is thus effectively insulated so as to maintain the heat transmitted to said junction when the thermal junction at 39 is heated by the pilot flame, whereby the difference in temperature between the thermal junction at 39 and the internal thermal junction at 42 is more quickly reduced when the heating of the junction 39 is discontinued. This makes for quicker operation of the safety control device to safety position when the pilot flame is extinguished.

The curved or angular form of the thermocouple 35 permits disposition of its inner end in axial alignment with the lead member 8 so that the desired connection may be provided between the thermocouple elements and the inner and outer lead conductors substantially in a straight line, and, at the same time, the outer end of the thermocouple is disposed in the path of the pilot flame 32 which issues in a direction substantially parallel with and offset laterally from the inner end of the thermocouple. The thermocouple and pilot burner constitute a unitary assembly that may be mounted as a unit and in which the desired position of the thermocouple relative to the pilot flame is at all times assured.

In one illustrative use of the device, the pilot burner is mounted in juxtaposition to a main burner (not shown) for the purpose of igniting the same. As long as the pilot flame 32 is burning, the thermo-electric current set up thereby energizes the electromagnet to hold the safety control device in operating position. Upon extinguishment of the pilot flame the electromagnet ceases to be energized sufficiently to hold the safety control device in operating position, and said control device moves to a safety position shutting off the fuel supply to the burner. This is all fully shown and described in the patent and copending applications herein mentioned, and therefore detailed illustration and description of the same will not be repeated here.

In practice, the tubular lead member 8 may be sufficiently flexible to permit it to be bent or turned to different positions or around corners to position the thermocouple and pilot burner as desired. At the same time, the lead member 8 may be of a character to support the thermo-

couple and pilot burner after it is bent or turned to the desired position, although of course supporting brackets for supporting the thermocouple and pilot burner may be employed and, therefore are contemplated within the scope of the present invention.

The embodiment of the invention illustrated in Figure 2, except as will hereinafter appear, is similar to the embodiment illustrated in Figure 1 and like parts are indicated by primed reference characters corresponding with the reference characters used in Figure 1.

In the embodiment shown in Figure 2, the body member 5' is shorter and the thermocouple 35', comprising external and internal thermocouple elements 36' and 38' joined to form the hot thermal junction at 39', is of straight or rectilinear form instead of being curved or angular as in the preceding embodiment of the invention.

The sleeve member 20' is screwed directly into the laterally extending portion 12' of the body member 5', and the nozzle or jet member 16' is secured at 17' in the sleeve member 20' instead of being screwed directly into the laterally extending portion 12' of the body member 5' as before. The venturi and air inlet are indicated at 20' and 26' respectively, as in the preceding embodiment of the invention, but the nozzle or jet member 23', instead of having its port 30' directed axially of the device, has this port 30' directed obliquely toward the outer end of the thermocouple so that the pilot flame 32' will act upon or heat the thermocouple without making the thermocouple of curved or angular form to bring it into the path of the pilot flame.

If desired, the port 30' may be in axial alignment with the port 18', and a baffle or system of baffles (not shown) may be employed to divert the flame to the thermocouple.

The advantages set forth in connection with the device shown in Figure 1 are secured with the device shown in Figure 2, and the device shown in Figure 2 is adapted for use in the manner described in connection with the device shown in Figure 1, or in any other suitable or preferred manner.

In Figure 3 the thermocouple 35'' comprises the curved external and internal metallic thermocouple elements 36'' and 38'' joined at their outer ends to form the thermal junction 39'' which is adapted to be heated by the pilot burner or other burner as in Figure 1. In this case, however, the outer end of the thermocouple is provided with an extended fin 50 in juxtaposition to the thermal junction 39''. The fin 50 is preferably of metallic or other suitable heat conducting material, the particular fin 50 shown being of annular form surrounding the thermal junction 39'' and being joined or secured to the outer end of the thermocouple in any suitable or preferred manner, as indicated at 52.

In operation of the device shown fragmentarily in Figure 3, the flame 32'', which corresponds with the flame 32 in Figure 1, impinges upon and crawls outwardly along the curved thermocouple, spreading and playing around under the fin 50. The heat thus imparted to the fin 50 is transmitted to the hot junction 39'', increasing the amount of heat transmitted to the hot junction of the thermocouple from the flame 32'', and thereby increasing the voltage of the thermo-electric current generated by the heat of the flame 32''.

A fin, such as that above described, may be provided at the hot junction of the thermocouple

shown in Figure 2, as well as on other forms of thermocouples within the scope of the broader aspects of the present invention.

I do not intend to be limited to the precise details shown or described.

I claim:

1. A thermocouple, pilot burner, and lead connection comprising an external metallic tubular thermocouple element, an internal metallic thermocouple element disposed within said external thermocouple element and joined at one end to one end of said external thermocouple element to form a thermal junction adapted to be heated, a metallic body member having an internal passage, the opposite end of said external thermocouple element being secured in said passage, an external tubular lead conductor joined to said body member, said external lead conductor supplying fuel into the passage in said body member, and an internal lead conductor extending through said external lead conductor and joined to the inner end of the internal thermocouple element within the passage in said body member, said body member having a port communicating with said passage and through which port fuel is discharged to maintain a pilot flame in position to heat the junction at the outer end of the thermocouple.

2. A thermocouple, pilot burner, and lead connection comprising an external metallic tubular thermocouple element, an internal metallic thermocouple element disposed within said external thermocouple element and joined at one end to one end of said external thermocouple element to form a thermal junction adapted to be heated, a metallic body member having an internal passage, the opposite end of said external thermocouple element being secured in said passage, an external tubular lead conductor joined to said body member, said external lead conductor supplying fuel into the passage in said body member and connected in circuit with the external thermocouple element through said body member, an internal lead conductor extending through said external lead conductor and joined to the inner end of the internal thermocouple element within the passage in said body member, said body member having a port communicating with said passage and through which port fuel is discharged substantially axially from the outer end of the body member to maintain a pilot flame and the outer end of the thermocouple being turned laterally to position to be heated by said pilot flame.

3. A thermocouple, pilot burner, and lead connection comprising an external metallic tubular thermocouple element, an internal metallic thermocouple element disposed within said external thermocouple element and joined at one end to one end of said external thermocouple element to form a thermal junction adapted to be heated, a metallic body member having an internal passage, the opposite end of said external thermocouple element being secured in said passage, an external tubular lead conductor joined to said body member, said external lead conductor supplying fuel into the passage in said body member and connected in circuit with the external thermocouple element through said body member, an internal lead conductor extending through said external lead conductor and joined to the inner end of the internal thermocouple element within the passage in said body member, the thermocouple extending substantially rectilinearly from said body member and said body member having

an obliquely directed port communicating with said passage and through which port fuel is discharged obliquely to maintain a pilot flame in position to heat the outer end of said thermocouple.

4. A thermocouple, pilot burner, and lead connection comprising a conducting body member having a passage extending longitudinally therethrough, an external tubular lead conductor secured in one end of said passage, an external metallic tubular thermocouple element secured in the other end of said passage, an internal thermocouple element disposed within said external thermocouple element and joined at its outer end to the outer end of said external element to form a thermal junction, the inner end of said internal thermocouple element extending from the inner end of said external thermocouple element and into the passage in said body member, said external lead conductor supplying fuel to said passage and connected in circuit with said external thermocouple element through said body member, and an internal lead conductor extending through said external lead conductor and joined to the inner end of the internal thermocouple element within said passage, said body member having a port communicating with said passage and through which port fuel is discharged to maintain a pilot flame in position to heat the junction at the outer end of the thermocouple.

5. A thermocouple, pilot burner, and lead connection comprising a conducting body member having a passage extending longitudinally therethrough, an external tubular lead conductor secured in one end of said passage, an external metallic tubular thermocouple element secured in the other end of said passage, an internal thermocouple element disposed within said external thermocouple element and joined at its outer end to the outer end of said external element to form a thermal junction, the inner end of said internal thermocouple element extending from the inner end of said external thermocouple element and into the passage in said body member, said external lead conductor supplying fuel to said passage and connected in circuit with said external thermocouple element through said body member, an internal lead conductor extending through said external lead conductor and joined to the inner end of the internal thermocouple element within said passage, a pair of coaxial jet members mounted on said body member laterally of said passage and communicating therewith, said jet members defining a space therebetween and one of said jet members having a port through which fuel is discharged to maintain a pilot flame in position to heat the junction at the outer end of the thermocouple, and an air inlet port opening into the space between said jet members.

6. In a thermocouple, pilot burner, and lead connection, a conducting body member having a passage extending longitudinally therethrough, a thermocouple secured in one end of said passage and comprising a pair of thermocouple elements, an external tubular lead conductor secured in the other end of said passage, said external lead conductor supplying fuel to the pilot burner and connected in circuit with one of the thermocouple elements, an internal lead conductor extending through said external lead conductor and connected in circuit with the other thermocouple element, and jet means on said body member laterally of said passage communicating with said passage for discharging fuel to

maintain a pilot flame in position to heat said thermocouple.

7. A thermocouple, pilot burner, and lead connection, comprising a conducting body member having a passage extending longitudinally there- 5 through, an external tubular lead conductor secured in one end of said passage, an external metallic tubular thermocouple element secured in the other end of said passage, an internal thermocouple element disposed within said ex- 10 ternal thermocouple element and joined at its outer end to the outer end of said external element to form a thermal junction, the inner end of said internal element extending from the inner end of said external element and into the passage in said body member, said external lead 15 conductor supplying fuel to said passage and connected in circuit with said external thermocouple element through said body member, an internal lead conductor extending through said external lead conductor and joined to the other end of the internal thermocouple element within said passage, a pair of coaxial jet members 20 mounted on said body member laterally of said passage and communicating therewith, said jet members defining a space therebetween and one of said jet members having a port through which fuel is discharged substantially axially to main- 25 tain a pilot flame, and an air inlet port opening into the space between said jet members, the outer end of the thermocouple being turned laterally to position to be heated by said pilot flame.

8. A thermocouple, pilot burner, and lead connection, comprising a conducting body member having a passage extending longitudinally there- 30 through, an external tubular lead conductor secured in one end of said passage, an external metallic tubular thermocouple element secured in the other end of said passage, an internal thermocouple element disposed within said ex- 40 ternal thermocouple element and joined at its outer end to the outer end of said external element to form a thermal junction, the inner end of said internal element extending from the inner end of said external element and into the pas- 45 sage in said body member, said external lead conductor supplying fuel to said passage and connected in circuit with said external thermo-

couple element through said body member, an internal lead conductor extending through said external lead conductor and joined to the inner end of the internal thermocouple element within said passage, the thermocouple extending sub- 5 stantially rectilinearly from said body member, a pair of coaxial jet members mounted on said body member laterally of said passage and communicating therewith, said jet members defining a space therebetween and one of said jet mem- 10 bers having a port through which fuel is discharged obliquely to maintain a pilot flame in position to heat the outer end of the thermocouple, and an air inlet port opening into the 15 space between said jet members.

9. A thermocouple comprising an external tubular thermocouple element and an internal thermocouple element extending through said external thermocouple element and joined at its 20 outer end to the outer end of said external thermocouple element to form a thermojunction adapted to be heated by a flame, and an extended heat conducting fin mounted on the outer end of said external thermocouple element, said fin 25 extending outwardly from the external thermocouple element and operative to confine a flame applied externally to the external thermocouple element inwardly of the outer end of the thermo- 30 couple and to conduct heat from the flame to the thermojunction which is adapted to be heated by said flame.

10. In a device of the class described, an inner metallic thermocouple member, an outer tubular thermocouple member enclosing said inner thermo- 35 couple member and having an imperforate outer end joined to the outer end of said inner thermocouple member to form a thermojunction adapted to be heated by a flame, and a heat conducting fin mounted on the outer end of the 40 outer thermocouple member and extending outwardly from the imperforate outer end of said outer thermocouple member to confine a flame applied externally to said outer thermocouple 45 member inwardly of the outer end thereof and to conduct the heat from the flame to the thermojunction between the outer ends of said inner and outer thermocouple members.

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