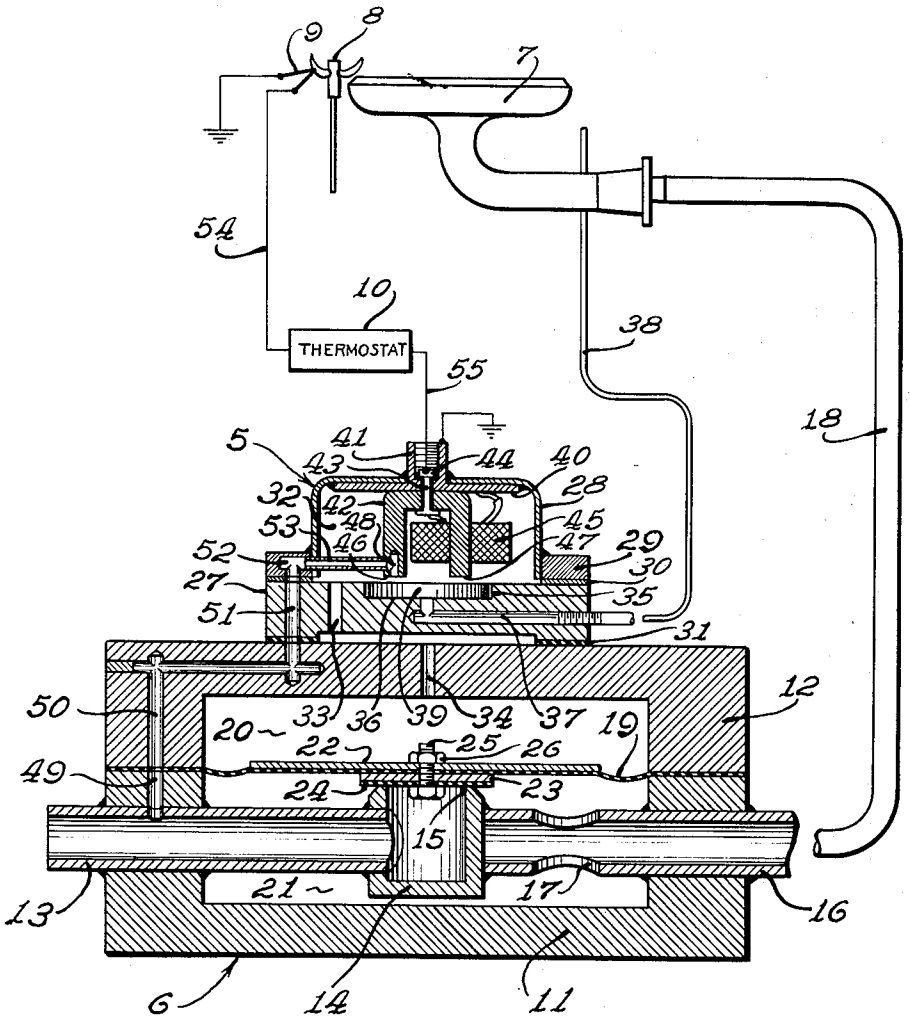
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MAGNETIC VALVE

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MAGNETIC VALVE

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1 Claim. (Cl. 251—141)

This invention relates to improvements in magnetically operated valves, and more particularly to valves operable on relatively small amounts of power, for example the power available from a single thermoelectric generator.

A general object of the invention is to provide an improved magnetically operated valve which is characterized by its simplicity of construction and efficiency in operation, there being no levers or other force transmitting mechanism utilized therein.

Another object of the invention is to provide an improved valve of the aforementioned character having a power unit which includes a magnet having a pole face and also having a fuel passage which communicates with said pole face, there being an armature coacting with said magnet which also functions as a valve member to seal off said fuel passage when said armature is in attracted position with respect to the magnet pole face.

Another object of the invention is to provide an improved valve of the class described which is direct-acting in character and is operable on the power available from a single thermoelectric generator, said valve being well adapted for use in connection with a diaphragm type valve for controlling the operation of the latter.

A more specific object of the invention is to provide an improved valve of the character described wherein the armature is also cooperable with a vent passage to seal off the latter when said armature permits fuel flow through the pole face fuel passage, said armature being operable to open said vent passage on movement to attracted position.

Another object of the invention is to provide an improved valve of the class described which lends itself to economical manufacture by mass production methods.

Other objects and advantages of the invention will become apparent as the description proceeds, reference being had to the accompanying drawing illustrating one complete embodiment of the invention. In the drawing:

The sole figure is a vertical sectional view of the improved valve embodied in a fuel burning apparatus which is shown semi-diagrammatically.

In the drawing, the numeral **5** indicates the improved valve associated with a diaphragm type valve **6** for the control of the flow of fuel to a main burner **7**, there being a pilot burner **8** in coacting relationship with the main burner **7**, and there being a thermoelectric generator **9**, for example a thermocouple, subject to the heat of the pilot burner flame for supplying thermoelectric current to the valve **5** under the control of a thermostat **10**.

The diaphragm valve **6** may comprise a pair of complementary cup-shaped valve body sections **11** and **12**. The section **11** is provided with a fuel inlet conduit **13** which is fixed to and communicates with the interior of a centrally disposed cup-shaped fitting **14**, the open upper end of which provides an annular valve seat **15**. The body section **11** is also provided with a fuel outlet conduit **16** which may be fixed to the fitting **14** as shown and may be provided with a cross bore **17** affording a fuel outlet opening. The fuel inlet conduit **13** may be connected to

a suitable source of gaseous fuel under pressure (not shown), and the fuel outlet conduit **13** may be connected to the main burner **7** through a fuel supply conduit **18**.

A flexible diaphragm **19** is marginally clamped between the valve body sections **11** and **12** to provide a chamber **20** within the section **12** and a chamber **21** within the section **11**, the sections **11** and **12** being held in assembled relation by suitable connecting members (not shown). A central portion of the diaphragm **19** is clamped between a back-up plate **22** and a valve member **23**, the latter having a resilient facing **24**. The valve member **23** and back-up plate **22** are held together for example by a screw **25** and a nut **26** threaded thereon. The valve member **23** is cooperable with the valve seat **15** to control the flow of gaseous fuel through the valve **6**.

The valve **5** comprises a base plate **27** which may be mounted on the body section **12** of the valve **6** as shown. A generally cup-shaped hood or casing **28** is mounted on the base plate **27** to form a chamber **32** therewith, said casing being provided with an annular attaching flange **29** of substantial thickness. The hood **28** and base plate **27** are secured to the body section **12** by suitable connecting members (not shown) and a gas tight seal is effected between the connected parts by annular sealing spacers **30** and **31** which may be of plastic or other suitable material. The base plate **27** and body section **12** are formed respectively with passages **33** and **34** to afford communication between the chambers **32** and **20**. The upper surface of the base plate **27** is formed with a cup-shaped recess **35** having a smoothly grounded flat bottom surface **36**. The base plate **27** is also provided with an L-shaped vent passage **37** which communicates with the surface **36** as shown, there being a vent conduit **38** communicating with the outer end of the passage **37** and terminating adjacent the main burner **7**. Positioned in the recess **35** is a cylindrical armature **39** having a diameter substantially smaller than that of the recess **35** and having a thickness substantially equal to the depth of said recess. The armature **39** is made of magnetically permeable metal, for example the steel alloy commonly known as Alleghany 4750, and said armature has smoothly ground flat upper and lower surfaces.

The hood **28** is provided with a fitting **40** having an internally threaded externally projecting socket **41** sealingly extending through the end wall of said hood. A permeable magnet frame **42**, which may be generally U-shaped, is fixedly mounted within the hood **28** by an insulated connector **43** having a terminal tip **44** exposed within the socket **41**. The magnet frame **42** is provided with a flux generating coil **45** which may be wound on one of the arms thereof, said coil having one end in circuit with the connector **43** as shown and having its other end grounded to the fitting **40** as shown. The magnet frame **42** is provided with a pair of smoothly ground coplanar pole faces which are preferably parallel with the recess surface **36** and are spaced from the upper surface of the armature **39** when the latter is in the retracted position shown.

The arm of the magnet frame **42**, not provided with the coil **45**, is formed with an angled fuel passage **48** which opens into the pole face **46**, as shown, said passage also opening through the side wall of said arm. Means is provided for supplying gaseous fuel under pressure to the passage **48**, said means including communicating passages **49** and **50** in the body sections **11** and **12** respectively, and passages **51** and **52** in the base plate **27** and connecting flange **29** respectively. A conduit **53** affords communication between the passages **52** and **48** as shown.

In the illustrated electrical circuit one terminal of the thermoelectric generator **9** is grounded as shown, and the other terminal of said generator is connected in

circuit with one terminal of the thermostat **10** by a conductor **54**. The other terminal of the thermostat **10** is connected to the terminal tip **44** by a conductor **55**, and the fitting **40** is suitably grounded as shown to complete the series circuit between the generator, thermostat and flux-generating coil.

In operation of the illustrated apparatus, the thermoelectric generator **9** is continuously heated by the flame of the pilot burner **8**, but when the thermostat **10** is not calling for heat, no substantial current can flow to the flux generating coil **45** and the latter is deenergized. With the coil **45** deenergized, the armature **39** is retained in the retracted position shown by gravity and fluid pressure. In this position the lower surface of the armature sealingly engages the surface **36** which in effect functions as a valve seat, said armature thereby sealing off the vent passage **37**. At the same time the fuel passage **48** is uncovered and communicates with the chamber **32**. Fuel under pressure thus flows from the inlet conduit **13** through the passages **49**, **50**, **51** and **52**, conduit **53** and passage **48** into the chamber **32**. The fuel under pressure flows from the chamber **32** through the passages **33** and **34** and into the chamber **20**. The fuel pressure acting on the diaphragm **19**, together with the weight of back-up plate **22** and valve **23**, causes the valve **23** to be moved onto the seat **15** to prevent the flow of fuel to the main burner **7**.

When the thermostat **10** calls for heat, it completes the series circuit between the generator **9** and coil **45**, causing the latter to generate flux which links the armature **39** and lifts the latter into engagement with the pole faces **46** and **47**. When the armature is in the raised or attracted position, its upper surface sealingly engages the pole face **46** and closes off the fuel passage **48**. Lifting of the armature **39** affords communication between the vent passage **37** and chamber **32**, so that the fuel entrapped within said chamber and in the chamber **20** can be vented through the conduit **38** and burned at the main burner. On venting of the chamber **32**, the pressure within the chambers **32** and **20** drops to or near atmospheric, and the pressure of the fuel within the fitting **14** and below the valve **23** lifts said valve off the seat **15** to permit fuel flow to the main burner **7**.

When the thermostat **10** no longer calls for heat, it interrupts the flow of current from the generator **9** to the coil **45**, whereupon the armature **39** drops to the lowered or retracted position shown under the bias of the pressure of the fuel from the passage **48** as well as that of the force of gravity. This shuts off the vent passage **37** and uncovers the inlet passage **48** to permit the fuel pressure to build up in the chambers **32** and **20**, with resultant closure of the valve **23** on the seat **15** and shut-off of all fuel flow to the main burner **7**.

While the illustrated valve **5** is shown in conjunction with the diaphragm valve **6**, it is obvious that the application of said valve **5** is in no wise limited to use with diaphragm valves. By utilizing the armature **39** as a valve member, and by utilizing one of the magnet frame pole faces as a valve seat, a compact and efficient structure is provided, said structure having a relatively small number of parts and being entirely devoid of levers, pivots and other friction producing elements commonly formed in force transmitting mechanisms.

The form of the invention selected for illustration is used for the purpose of disclosure only and is not intended to impose unnecessary limitations on the claims or to confine the patented invention to a particular use. Various changes and modifications may be made without departing from the spirit of the invention, and all of such changes are contemplated as may come within the scope of the claim.

What is claimed as the invention is:

In combination: A valve body having a chamber and having a vent passage outlet opening centrally located in the bottom of said chamber and provided therein with a valve seat; a permeable, generally U-shaped magnet frame having a pair of spaced legs terminating in spaced coplanar horizontal pole faces within said chamber spaced above said valve seat, said magnet frame being formed with a fuel inlet passage terminating in a port communicating with one of said pole faces; means for supplying fuel under pressure to said passage; a flux-generating coil on said frame; and a permeable imperforate armature in said chamber coacting with said magnet frame and having upper and lower planar surfaces, said armature being movable in response to energization of said coil from a lowered position wherein the lower armature surface is in sealing engagement with said vent passage valve seat and the upper armature surface is spaced from said magnet pole faces, to a second position wherein the upper armature surface engages the entire surface area of said ported magnet pole face and sealingly closes said fuel inlet passage and the lower armature surface is spaced from said vent passage valve seat, wherefore said chamber is subjected to the fuel pressure of said fuel supplying means when said armature is in said first position and said chamber is isolated from said fuel supplying means and vented to the atmosphere when said armature is in said second position.

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