May 29, 1934. A. J. GILBERT 1,960,843

VALVE STRUCTURE

Filed Dec. 21, 1931 2 Sheets-Sheet 1

Fig. 1.

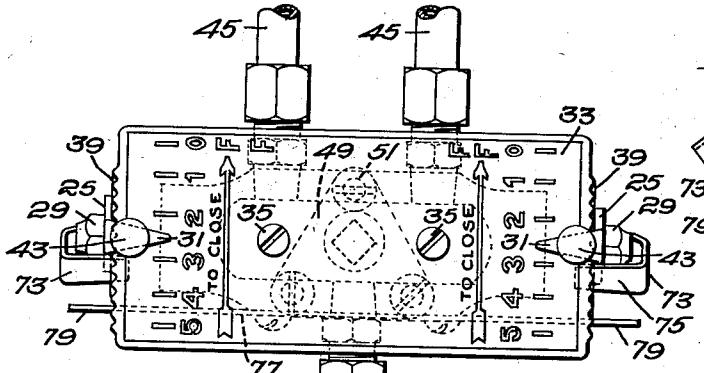


Fig. 5.

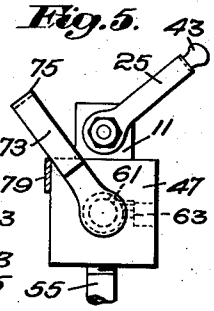


Fig. 2.

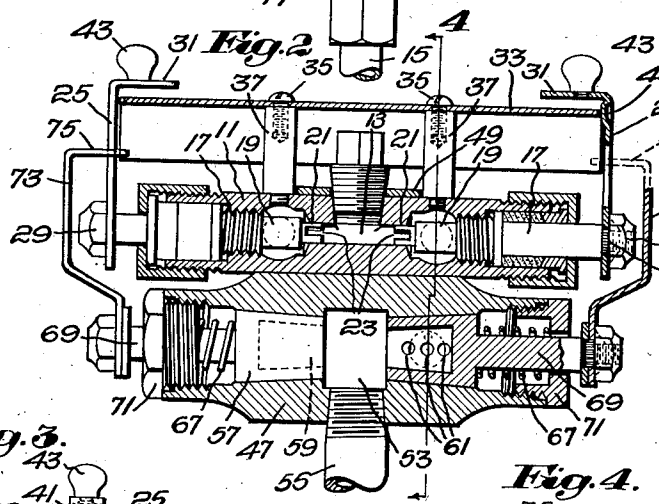


Fig. 6.

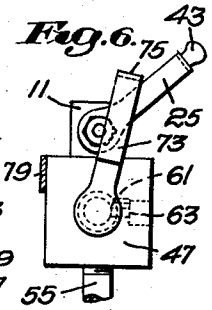


Fig. 7.

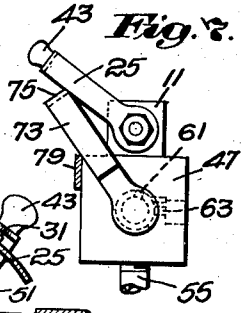


Fig. 3.

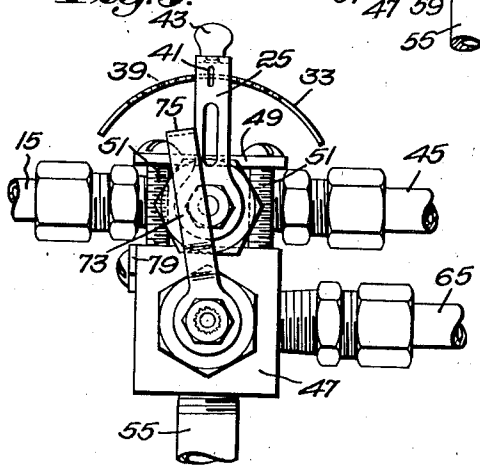
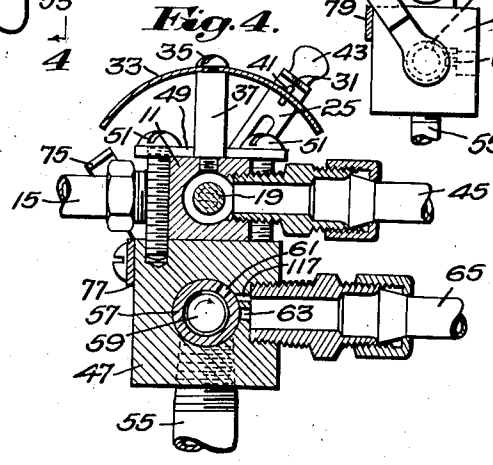


Fig. 4.



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Fig. 8.

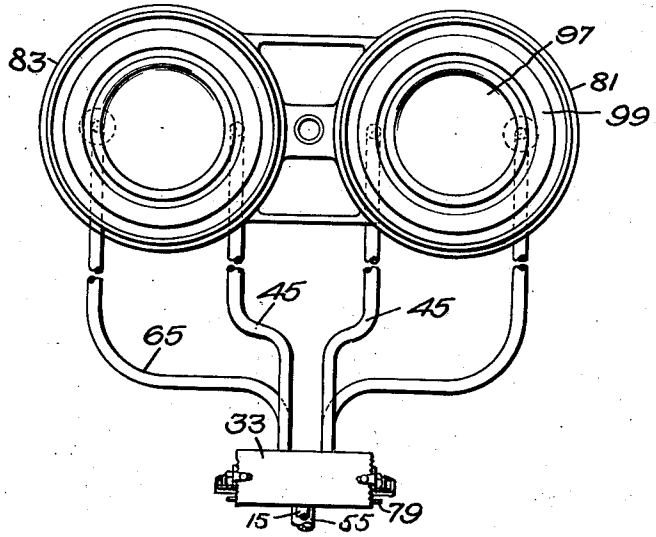
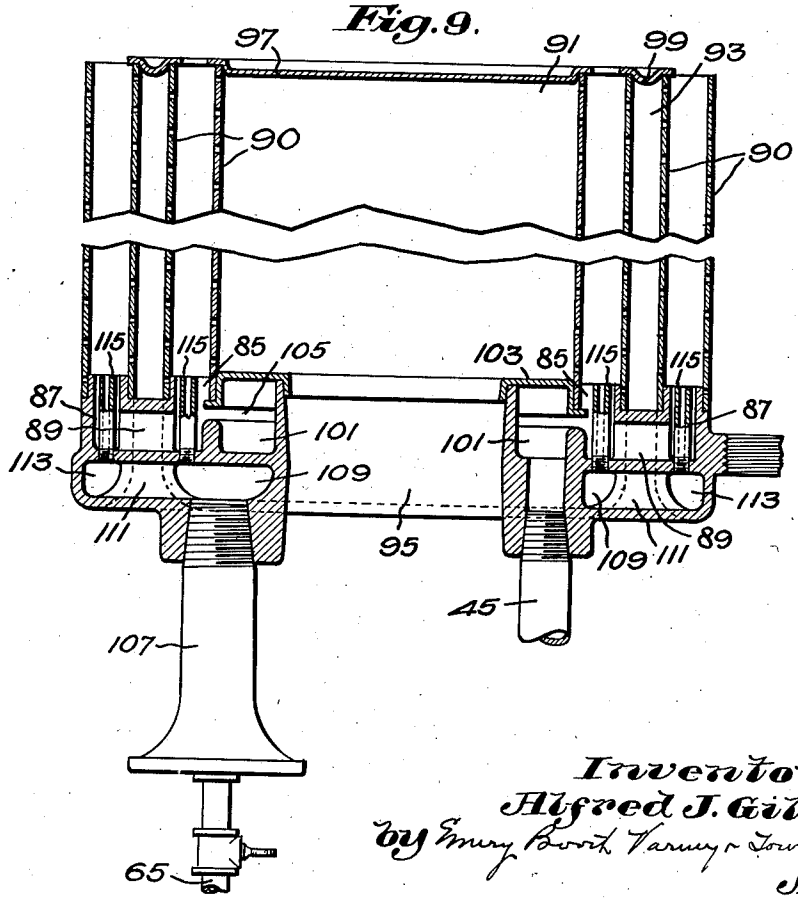


Fig. 9.



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UNITED STATES PATENT OFFICE

1,960,843

VALVE STRUCTURE

Alfred J. Gilbert, Windsor, Conn., assignor to The Silent Glow Oil Burner Corporation, Hartford, Conn., a corporation of Connecticut

Application December 21, 1931, Serial No. 582,426

15 Claims. (Cl. 158—120)

This invention relates to control valves, being intended more particularly, though not exclusively, for the control of liquid fuel burners such that the burner may be operated under either liquid or gaseous fuel, or both.

The invention will be best understood by reference to the following description when taken in connection with the accompanying illustration of one specific embodiment thereof, while its scope will be more particularly pointed out in the appended claims.

In the drawings:

Fig. 1 is a plan view of a valve embodying one form of the invention, comprising a combined oil and gas duplex valve and showing the indicating scale and index member for both sets of valves;

Fig. 2 is a central, longitudinal section taken through the valve structure shown in Fig. 1;

Fig. 3 is an elevation looking toward the right-hand end of the valve structure, as seen in Figs. 1 and 2;

Fig. 4 is a cross-sectional elevation of the valve structure, taken on the line 4—4 in Fig. 2;

Figs. 5, 6 and 7 show different positions of the valve actuating members which control the oil and gas supply;

Fig. 8 is a plan view of a typical oil and gas burner, to the control of which the illustrated form of valve is shown applied; and

Fig. 9 is a cross-sectional elevation of the burner illustrated in Fig. 8, showing the arrangement of oil and gas passages.

Referring to the drawings and to the embodiment of the invention there shown for illustrative purposes, and more particularly to Figs. 1 to 4 inclusive, and referring first to the valve for the liquid fuel (liquid fuel being herein referred to for descriptive purposes as oil), the latter comprises an elongated valve casing 11 having an interior supply chamber 13 intermediate and herein substantially midway between its ends to which oil is supplied from a common source through pipe connections 15.

At each opposite end of the supply chamber 13 the casing has formed therein a port of circular cross section, the two ports being in axial alignment and cooperatively related to control valves, which valves are also axially aligned but oppositely disposed. One valve only need be described as they are similar in construction, except in respect to the features hereinafter referred to.

Each valve comprises a stem 17 having threaded engagement with the bore of the casing so as to be capable when turned of being advanced or retracted with relation to its port. In advance of the threaded portion of the stem, the latter is provided with a head 19 of reduced cylindrical cross section to provide an annular oil delivery space about the same, the head having a shoulder at its forward end adapted positively to seat against and close the adjoining port and having also a protruding end 21 entering into and having a sliding fit within the port opening. The entering head is so shaped by the transverse slot 23 formed in its end that when the valve is rotated the port is opened, at first slowly, and then by an increasing amount as more of the slot is uncovered. The pitch of the threads on the stem is such that a partial turn of the stem will move the valve from a closed position to a position in which the port is sufficiently opened to provide the required full supply of oil for the burner.

The valve stems protrude through the opposite ends of the casing where there is provided the usual packing gland and retaining nut. To the end of each valve stem there is secured a valve actuating member in the form of a radial arm 25 clamped to a shouldered portion 27 of the stem by the nut 29, the shoulder portion 27 and the interengaging part of the arm being formed with small interfitting notches or teeth which hold the arm fixedly on the same but permit it to be removed or readjusted to different angular positions to compensate for wear, or for other reasons requiring a resetting of the arm. Each arm extends radially upward and terminates in a lateral extension 31 forming an index member in the shape of a finger or pointer extending inwardly and over but in close relation to a scale or series of graduations representing the degree of port opening and the rate at which oil is being supplied. These graduations are marked at each opposite end of the covering shield 33 which overlies the entire valve structure and is parti-cylindrical in shape, the axis of the cylinder coinciding approximately with the axes of the valve stems 17, so that the graduated edges of the shield will lie in approximate parallelism to the path of movement of the index member 31. The shield is secured by screws 35 to the upright studs 37 threaded into the top of the valve casing.

The opposite edges of the shield are provided with a series of notches or serrations 39 (Fig. 1) and the abutting edges of each arm have pressed or otherwise formed in them a somewhat rounded protrusion 41 (Fig. 2) adapted to engage the notches. The arm is preferably somewhat resilient and is clamped to the stem in such a po-

sition that it bears yieldably against the notched edge of the shield so that it may be held thereby in any assigned position to which it may be moved, but may be readily turned or slipped from one notch to another. The index member 31 is provided with a button 43 for convenient manipulation.

One valve stem (herein the right-hand one in Figs. 1 and 2) is provided with right-hand threads, while the opposite valve stem has left-hand threads, so that when opening or closing the respective valves both index members move in the same direction, as viewed from the operator's standpoint, that is to say, from above in Fig. 1, the right-hand valve having a counter-clockwise opening movement and the left-hand valve a clockwise opening movement. The result is that the index members in the closed or open position or in the same intermediate positions of both valves lie directly opposite each other in positions of substantial alignment, pointing toward each other along substantially the same element of the cylindrical shield.

When the valves are opened, oil passes from the central supply chamber 13 through the ports into the annular chambers surrounding the valve head 19, passing thence into the separate pipe connections or conduits 45 and thence to the burner.

Referring now to the cooperatively related valve for the gas supply, the latter comprises also an elongated valve casing 47 which is clamped to the bottom of the casing 11 by means of the triangular plate 49 and clamping screws 51. The gas valve casing also has an interior supply chamber 53 intermediate, and herein substantially midway between, its ends to which gaseous fuel under pressure is supplied through the supply pipe 55 from any suitable source, which, for example, may be the ordinary service main or a pressure storage tank.

Arranged within the valve casing 47 there are provided axially aligned and oppositely disposed gas valves 57 having each a tapered body fitting a tapered seat in the casing on which the valve turns and provided with a cored passage or chamber 59 extending part way into the valve body and opening into the supply chamber 53. The passage 59 has one or more ports 61 (herein three in number) which, when the valve is suitably positioned, register with delivery ports 63 (Fig. 4) in the side of the casing and open communication between the supply chamber and the gas delivery pipe 65, there being provided for each valve one such pipe leading to the burner. The valve 57 is kept pressed to its seat by the spring 67 encircling the valve stem 69 and held in place by the threaded cap piece 71 secured on the end of the valve casing. There are accordingly provided through the described structure opposite complementary sets of closely adjacent oil and gas valves, one set controlling the supply of oil and gas to one burner unit (as will be more fully explained), and the other set controlling the supply of oil and gas to the other burner unit.

Secured to the protruding end of each valve stem 69, by means similar to those described in connection with the oil valve, is an actuating member 73 comprising a radial arm which is so shaped as to clear the nut 29 but having a path of movement closely adjacent that of the arm 25 and provided with an inturned end 75 forming an abutment lying within the path of the oil valve actuator 25. Secured to the outside of the valve casing 47 there is provided a plate 77 having at each end a projecting extension 79 which lies within the path of the gas valve actuator 73 and serves as a positioning stop to limit the movement of same.

Before explaining the operation of the described combined gas and oil valve, its utility will be best understood by referring to the combined gas and oil burner, illustrated in Figs. 8 and 9, to which, for purposes of illustration, the valve is shown applied, this burner being similar to that disclosed in the co-pending application of Rallston M. Sherman, Serial No. 547,715, filed June 29, 1931.

This burner comprises two burner units 81 and 83 having each a base provided with an inner fuel groove 85 and an outer fuel grove 87 connected by ducts 89. Each fuel groove has formed thereover an annular combustion space provided between perforated chimneys or combustion tubes 90 through which air is supplied from an inner central air chamber 91 and an intermediate air chamber 93 as well as from the space outside the outer chimney. Air is supplied to the chamber 91 through a central opening 95 in the base and to the chamber 93 through openings formed in the base between the two grooves. The chamber 91 is closed at its top by the plate 97 and the chamber 93 by the plate 99.

Oil is supplied to the two burners by two oil delivery pipes 45 which lead to the two burner units, each entering the bottom of the base and delivering oil to the bottom of an inner vaporizing groove 101. The latter is covered by the cover plate 103 but communicates with the inner fuel groove 85 through the annular space 105.

Gaseous fuel is delivered to the two burners through the gas delivery pipes 65, each of which is connected to an air mixing device 107 adapted to deliver a mixture of gas and air to an annular chamber 109 formed in the burner beneath the inner groove 85 and communicating through ducts 111 with an outer air and gas chamber 113 beneath the outer groove 87. To deliver gaseous fuel to the combustion chambers a plurality of suitably spaced small hollow nipples or burner tubes 115 are threaded into the bottom of each of the two grooves 85 and 87 communicating each with one of the underlying air and gas chambers 109 and 111, providing a discharge orifice at or near the bottom of the combustion chamber well above the bottom of the fuel groove and above the level of unignited oil vapor. These tubes are so spaced with relation to the sides of the grooves and with relation to each other as to leave opportunity for free circulation of the oil vapor therein.

In the operation of the burner with oil, the oil is fed to the inner vaporizing groove 101 where it is vaporized, the oil vapor passing through the annular space 105 to the fuel groove 85 and through the ducts 89 to the fuel groove 87 where it burns within the two combustion chambers, producing a blue flame of intense heat.

The burner may be started by igniting the oil and permitting the burner to gradually come up to such a temperature as will cause the vaporization of the oil as rapidly as it is fed to the burner. If it is desired, however, to cut down the starting interval by employing the preheating effect of gas, the gas may be first turned on and ignited to preheat the burner. This quickly develops the full heating capacity of the burner to a point where the oil may be turned on, with the assurance of its being vaporized as soon as it enters the vaporizing space 101. The supply of gas is then continued while the oil is at first admitted

slowly, but as soon as the burner becomes more highly heated through the joint combustion of gas and oil, the former may be gradually cut off and the full supply of oil developed, the burner then working exclusively under the supply of oil. By this means the normally prolonged starting interval may be cut down to one of comparatively short duration. If, on the other hand, in the operation of the burner under oil, it is desired to force the burner beyond its oil heating capacity, the gas may be also supplied coincidently with the oil supply, or the burner may be operated through gaseous fuel alone.

The cooperative action of the two valves in effecting control of the burner will be best understood from Figs. 5, 6 and 7. When either of the oil valve actuators 25 is moved to the position represented in Figs. 5 and 6, the oil valve is closed and brought to rest by the seating of its valve head 19, the index member 31 then lying opposite the zero position on the scale. In this position of the oil valve actuator, the gas valve actuator 73 is free to be moved to any position between its fully closed position (Figs. 5 and 7) where it abuts against the positioning stop 79, and its fully open position (Fig. 6), where its inturned end 75 engages the oil valve actuator 25. In the position of the two actuators shown in Fig. 5, neither gas nor oil is being supplied to the burner. If it is desired to start up the burner with oil alone or to operate the burner on oil alone, with the gas valve closed, the oil valve actuator may be moved from the closed position (Fig. 5) to the full open oil supply position (Fig. 7), or to any intermediate position, and the burner supplied with oil and without any manipulation of the gas valve.

If it is desired to utilize gas alone for starting the burner or to operate the burner on gas alone, with the oil valve closed, the gas valve actuator may be moved from its closed position (Fig. 5) to its full open gas supply position (Fig. 6), or to any intermediate position, and the burner supplied with gaseous fuel and without any manipulation of the oil valve.

If, however, it is desired to start the burner with gas, and after starting, to operate it with oil, the gas valve actuator is first moved to its full open position (Fig. 6) and the gas supply continued until the temperature of the burner has reached a point sufficient to start the vaporization of the oil. Oil is then admitted to the burner by moving the oil valve part way toward its open position, admitting the oil at first at a slow rate and then, after vaporization is under way, at an increased rate, and finally moving it to the full open position shown in Fig. 7. In its opening movement, however, the oil valve actuator 25 engages the abutment 75 on the gas valve actuator and effects a closing movement of the gas valve, gradually shutting off the gas as the full open position of the oil valve is approached. A small leak port 117 (see Fig. 4) is provided in the gas valve casing so that the gas supply persists until just before the full open position of the oil valve is reached. When the full open supply position of the oil valve is reached, the oil valve actuator 25 is brought to rest against the abutment 75 of the gas valve actuator, which in turn is stopped by the limiting stop 79.

On the other hand, the opening movement of the gas valve, from the position shown in Fig. 7 to the position shown in Fig. 6, results in a closing movement of the oil valve so that neither oil nor gas at the maximum rate can be supplied at the same time to the burner, the intermediate position of the gas valve actuator, however, permitting at the same time a partial supply of oil and a partial supply of gas.

While I have herein shown and described for the purposes of illustration one specific embodiment of the invention, it is to be understood that extensive deviations may be made in the construction, form and relative arrangement of parts, all without departing from the spirit thereof.

I claim:—

1. A controlling valve structure for fuel consumption devices, comprising in the same structure a valve casing having a liquid fuel supply chamber intermediate its ends, axially aligned but oppositely disposed, rotatable liquid fuel valves controlling said fuel supply to separate delivery conduits, a second closely adjacent valve casing having a gaseous fuel supply chamber intermediate its ends and axially aligned but oppositely disposed rotary gas valves controlling said gaseous fuel supply to separate delivery conduits, thereby providing complementary but opposite sets of adjacent liquid fuel and gaseous fuel valves, a covering shield for the valve structure presenting adjacent each opposite edge a graduated scale, an actuating arm connected to each of said liquid fuel valves having a path of movement adjacent one of said scales, and an actuating arm connected to each of said gas valves having a path of movement closely adjacent the actuating arm for said adjacent liquid fuel valve.

2. A controlling valve structure for fuel consumption devices, comprising in the same structure a valve casing having a liquid fuel supply chamber intermediate its ends, axially aligned but oppositely disposed, rotatable liquid fuel valves controlling said fuel supply to separate delivery conduits, a second closely adjacent valve casing having a gaseous fuel supply chamber intermediate its ends and axially aligned but oppositely disposed rotary gas valves controlling said gaseous fuel supply to separate delivery conduits, thereby providing complementary but opposite sets of adjacent liquid fuel and gaseous fuel valves, one valve of each set having a clockwise opening movement and the other a counterclockwise opening movement, external actuating means for operating each set of valves, and oppositely arranged similar indicating devices for each set of valves comprising each an indicating scale member and cooperating index member, one of said members mounted to turn with said actuating means and the other secured to the valve casing.

3. A controlling valve structure for fuel consumption devices, comprising in the same structure a valve casing having a liquid fuel supply chamber intermediate its ends, axially aligned but oppositely disposed, rotatable liquid fuel valves controlling said fuel supply to separate delivery conduits, a second closely adjacent valve casing having a gaseous fuel supply chamber intermediate its ends and axially aligned but oppositely disposed rotary gas valves controlling said gaseous fuel supply to separate delivery conduits, thereby providing complementary but opposite sets of adjacent liquid fuel and gaseous fuel valves, one valve of each set having a clockwise opening movement and the other a counterclockwise opening movement, and coordinating control means to control both sets of valves for delivery of either liquid fuel or gaseous fuel, said control means in changing from one supply to the other providing a continuance of the established supply from

one source until the other source has been established.

4. A controlling valve structure for fuel consumption devices, comprising in the same structure a valve casing having a liquid fuel supply chamber intermediate its ends, axially aligned but oppositely disposed, rotatable liquid fuel valves controlling said fuel supply to separate delivery conduits, a second closely adjacent valve casing having a gaseous fuel supply chamber intermediate its ends and axially aligned but oppositely disposed rotary gas valves controlling said gaseous fuel supply to separate delivery conduits, thereby providing complementary but opposite sets of adjacent liquid fuel and gaseous fuel valves, one valve of each set having a clockwise opening movement and the other a counterclockwise opening movement, an external, manually operable, rotatable actuating member for each set of valves, and oppositely arranged similar indicating devices for the valve comprising each an indicating scale member and a cooperating index member, one of said members connected to turn with said actuating member and the other secured to the valve casing.

5. A controlling valve structure for fuel consumption devices, comprising an elongated valve casing having a liquid fuel supply chamber intermediate its ends, axially aligned but oppositely disposed, rotatable, positively seating, liquid fuel valves controlling said liquid fuel supply to separate delivery conduits, a second closely adjacent valve casing having a gaseous fuel supply chamber intermediate its ends and axially aligned but oppositely disposed, rotary gas valves controlling said gaseous fuel supply to separate delivery conduits thereby providing complementary sets of adjoining liquid fuel and gas valves, external actuating arms secured to each of said liquid fuel valves, one of said arms having a clockwise valve opening movement and the other a counterclockwise opening movement, an external actuating arm secured to each of said gas valves having a path of movement closely adjacent the path of movement of the adjoining liquid fuel valve actuator, and interengaging parts between each pair of adjacent actuators to cause the opening movement of one to effect the closing movement of the other.

6. In a controlling valve structure for fuel consumption devices, comprising in the same structure axially aligned but oppositely disposed liquid fuel valves and axially aligned but oppositely disposed gaseous fuel valves providing complementary sets of adjoining liquid fuel and gas valves, means for opening the liquid fuel supply valve of each set, one valve of each set having a clockwise opening movement and the other a counterclockwise opening movement, means for opening the gas supply valve of each set, and interengaging connections between the valves whereby movement of the liquid fuel valve to open its fuel supply effects a closing movement of the gas supply valve, while providing for a continuation of the gas supply until the liquid fuel supply has been established.

7. In a controlling valve structure for fuel consumption devices, comprising in the same structure axially aligned but oppositely disposed liquid fuel valves and axially aligned but oppositely disposed gaseous fuel valves providing complementary sets of adjoining liquid fuel and gas valves, one valve of each set having a clockwise opening movement and the other a counterclockwise opening movement, and interengaging connections between the valves of each set permitting each valve to be independently opened or closed in the closed position of the other but enforcing a closing movement of one valve on the opening movement of the other.

8. In a controlling valve structure for fuel consumption devices, comprising in the same structure axially aligned but oppositely disposed liquid fuel valves and axially aligned but oppositely disposed gaseous fuel valves providing complementary sets of adjoining liquid fuel and gas valves, an actuating member secured to each of said liquid fuel valves, an actuating member secured to each of said gas fuel valves, and interengaging parts on said members to cause movement of one to effect movement of the other.

9. A controlling valve structure for fuel consumption devices, comprising in the same structure axially aligned but oppositely disposed liquid fuel valves and axially aligned but oppositely dispose gaseous fuel valves providing complementary sets of adjoining liquid fuel and gas valves, one valve of each set having a clockwise opening movement and the other a counterclockwise opening movement, and means whereby movement of one valve of each set also serves to move the other valve.

10. A controlling valve structure for fuel consumption devices, comprising a rotatable, positively seating, liquid fuel valve, a closely adjacent rotary gaseous fuel valve having its axis parallel to that of the liquid fuel valve, an external actuating arm connected to turn with each valve, said arms having paths of angular movement in proximity to each other, one of said arms having an abutting part lying within the path of the other, and said arms being movable toward each other in the opening movements and away from each other in the closing movements of their respective valves, whereby each valve may be independently opened or closed in the closed position of the other but the opening movement of one valve acts through said abutting part to enforce a closing movement of the other.

11. A controlling valve structure for fuel consumption devices, comprising a positively seating, liquid fuel valve, a rotary gaseous fuel valve having its axis of rotation closely adjacent the axis of the oil valve, a stop to prevent movement of the gas valve after reaching its closed position, said valves having rotative opening movements, one in a clockwise and the other in a counterclockwise direction, and interengaging members connected one to each valve permitting each valve to be independently opened or closed in the closed position of the other but enforcing a closing movement of one valve on the opening movement of the other.

12. A controlling valve structure for fuel consumption devices, comprising a liquid fuel valve, a gaseous fuel valve, an actuating device for manually controlling the liquid fuel valve independently of the gaseous fuel valve when the latter is in closed position, and an actuating device for manually controlling the gaseous fuel valve having a part lying within the path of the first named actuating device for enforcing a closing movement of either valve through the opening movement of the other.

13. A controlling valve structure for fuel consumption devices, comprising a liquid fuel valve, a gaseous fuel valve, an actuating device for manually controlling the liquid fuel valve independently of the gaseous fuel valve when the latter is in closed position, an actuating device

for manually controlling the gaseous fuel valve, and interengaging parts for enforcing a closing movement of one valve through the opening movement of the other.

14. A controlling valve structure for fuel consumption devices, comprising a liquid fuel valve, a gaseous fuel valve, and interengaging members connected one to each valve permitting each valve to be independently opened or closed in the closed position of the other but enforcing a closing movement of one valve on the opening movement of the other.

15. A controlling valve structure for fuel consumption devices comprising in one structure two elongated casings arranged in parallel relation side by side, a gaseous fuel supply chamber with a supply connection intermediate the ends of one casing, axially aligned but oppositely disposed rotary gas valves controlling said gaseous fuel supply to separate delivery conduits, a liquid fuel supply chamber for the companion casing with a supply connection intermediate its ends, and rotatable liquid fuel valves controlling the fuel supply to separate delivery conduits thereby providing complementary but opposite sets of adjacent gaseous and liquid fuel valves.

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