Dec. 13, 1955 C. K. STROBEL 2,726,653

CONTROL AND IGNITION SYSTEM FOR GASEOUS FUEL BURNERS

Filed July 7, 1951 2 Sheets-Sheet 1

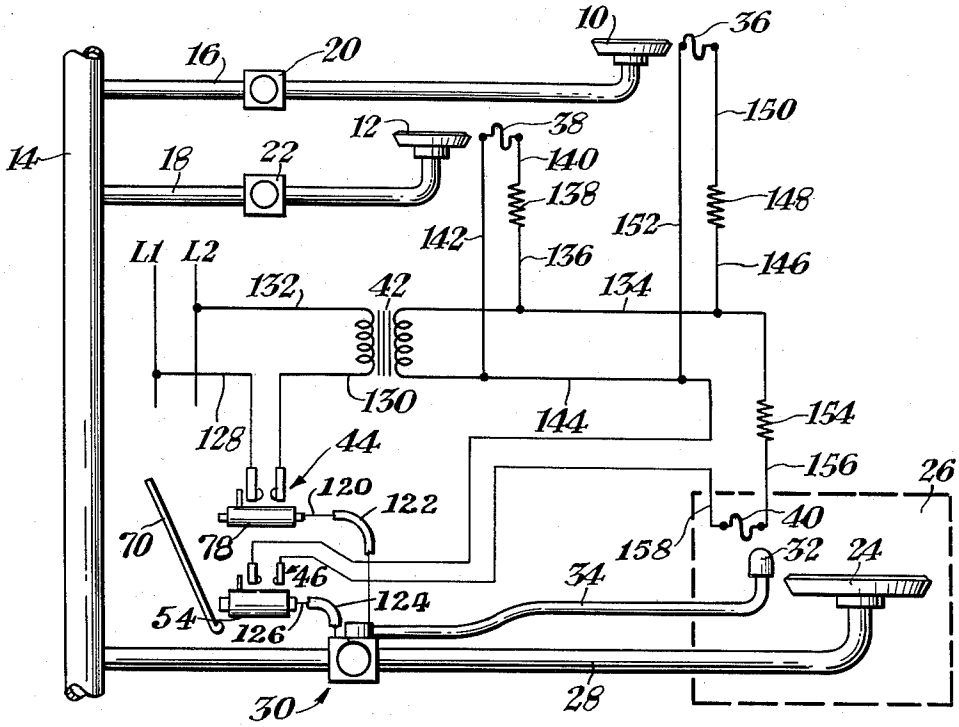


Fig. 1.

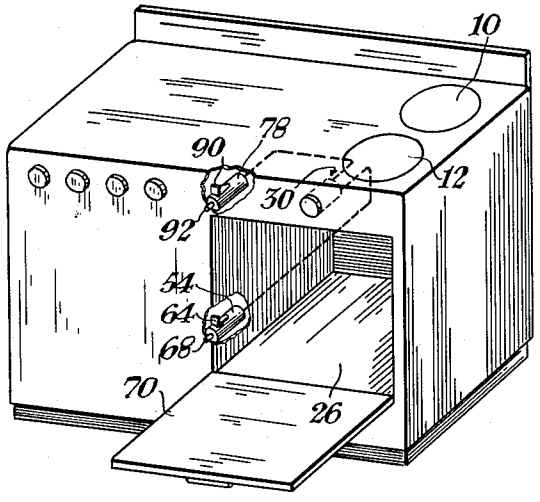


Fig. 4.

INVENTOR.
Charles K. Strobel.
BY
Albert J. Henderson
HIS ATTORNEY

Dec. 13, 1955 C. K. STROBEL 2,726,653

CONTROL AND IGNITION SYSTEM FOR GASEOUS FUEL BURNERS

Filed July 7, 1951 2 Sheets-Sheet 2

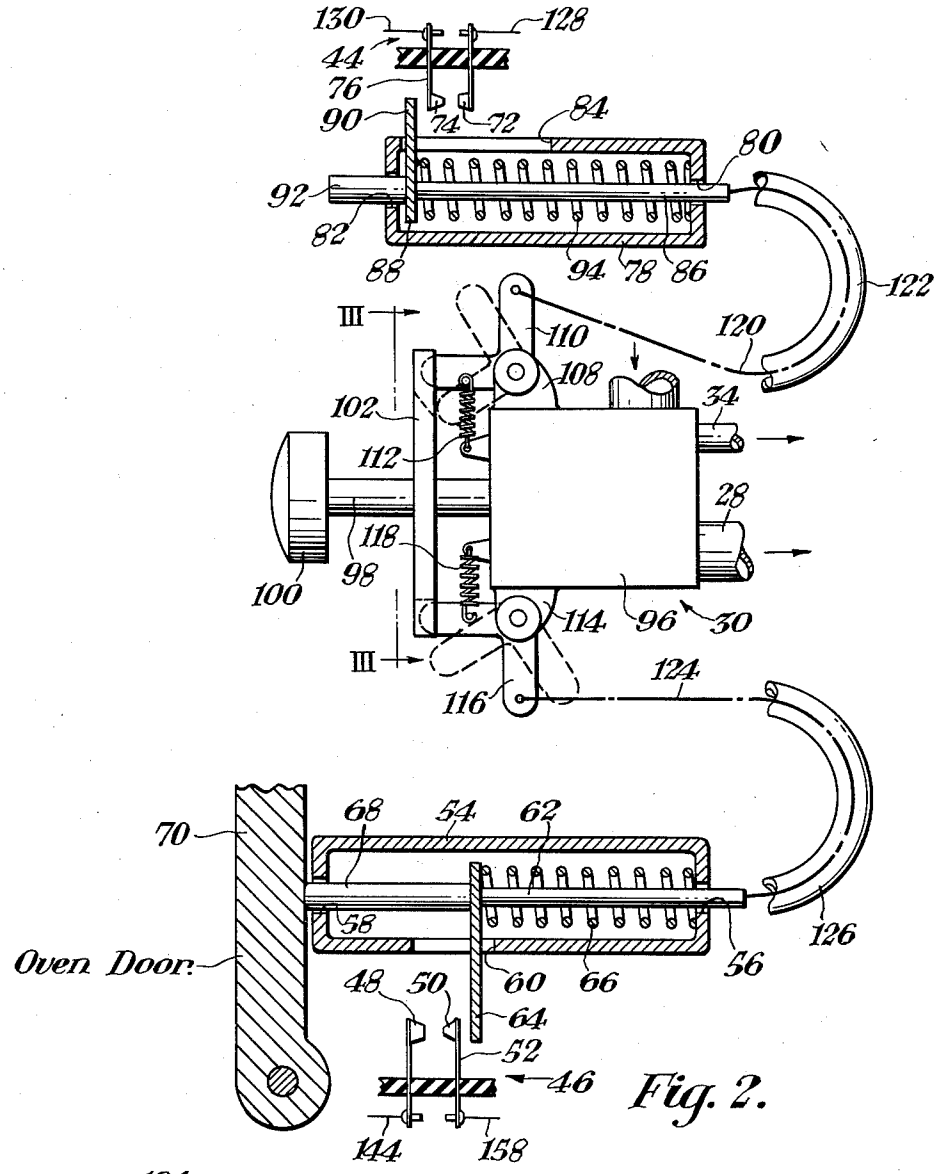


Fig. 2.

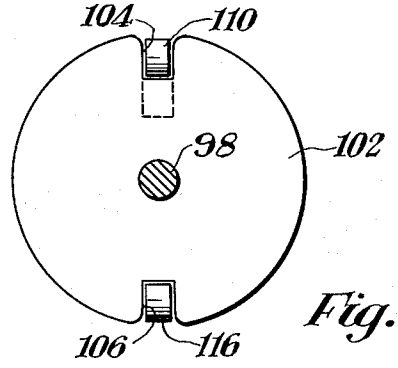


Fig. 3.

INVENTOR.
Charles K. Strobel.
BY
Albert J. Henderson
HIS ATTORNEY

United States Patent Office 2,726,653 Patented Dec. 13, 1955

2,726,653

CONTROL AND IGNITION SYSTEM FOR GASEOUS FUEL BURNERS

Charles K. Strobel, Pittsburgh, Pa., assignor to Robertshaw-Fulton Controls Company, Greensburg, Pa., a corporation of Delaware

Application July 7, 1951, Serial No. 235,655

4 Claims. (Cl. 126—42)

This invention relates to control and ignition systems for gaseous fuel burners and more particularly to such systems as applicable to gaseous fuel burning ranges.

In gas ranges, the accumulation of unburned fuel in the enclosed space defined by the oven compartment has long been a hazard since such accumulation may be ignited with explosive violence. In the great majority of cases where such an accumulation occurs, it is a result of carelessness on the part of the operator in opening the valve controlling the flow of fuel to the oven burner without first venting the oven compartment and providing for immediate ignition of fuel flowing from the burner.

A principal object of this invention is to require an operator to follow a safe lighting procedure when lighting an oven burner.

Another object of this invention is to preclude the possibility of an operator opening a fuel control valve to supply fuel to an oven burner without first opening the oven door and operating a control member for supplying operative energy to an oven burner igniter.

Another object of this invention is to prevent operation of an oven burner fuel control valve unless the oven door has been opened.

Another object of this invention is to prevent operation of an oven burner fuel control valve in the absence of a supply of operative energy to an oven burner igniter.

Another object of this invention is to prevent the supply of operative energy to an oven burner igniter when the oven door is closed.

Another object of this invention is to make a flame at an oven burner visible to an operator during the oven igniting operation to thereby insure safe lighting.

Another object of this invention is to control the supply of operative energy to igniters for top and oven burners of a gas range by means of a single manually operable control member while insuring safe ignition of the oven burner.

In a preferred embodiment of this invention, movement of an oven burner fuel control valve to open position is precluded by a detent operatively associated with the oven door to release the valve when the door is moved to open position and a switch controlling the energization of an electric oven igniter is also operatively associated with the oven door to be closed when the oven door is opened.

Other objects and advantages will appear from the following specification taken in connection with the accompanying drawings wherein:

Fig. 1 is a diagrammatic showing of a control and ignition system for a range embodying this invention;

Fig. 2 is an enlarged detailed showing of a portion of the system shown in Fig. 1;

Fig. 3 is a sectional view taken on the line III—III of Fig. 2; and

Fig. 4 is a perspective view of a range showing a preferred disposition of the parts of the system shown in Fig. 2.

Referring to Fig. 1 of the drawings, the control and ignition system is shown as applied to a domestic gas range

having a pair of top burners **10, 12** connected to a manifold **14** by conduits **16, 18**. The manifold **14** is adapted for connection to a source of gaseous fuel supply (not shown) and flow of fuel in the conduits **16, 18** is under the control of suitable valves **20, 22**.

An oven burner **24** disposed within the oven compartment **26** of the range is connected to the manifold **14** by means of a conduit **28**. Flow of fuel in the conduit **28** is under the control of a combined thermostatically controlled valve and shut off cock **30** of a type well known in the art. The shut off cock of the combination valve **30** also controls the flow of fuel to a pilot burner **32** which is connected to the valve **30** by a conduit **34**. The pilot burner **32** is disposed within the oven compartment **26** proximate the oven burner **24** and adapted, when lighted, to ignite fuel issuing from the oven burner **24**.

It is to be understood that the flow of fuel to the pilot burner **32** is independent of the thermostatically controlled valve of the combination valve and, since arrangements of this type are well known in the art, further description thereof is deemed unnecessary.

Ignition means are provided for the burners and are here shown as electric resistance igniters **36, 38, 40** disposed proximate the top burner **10**, top burner **12** and oven pilot burner **32** respectively. Each of the igniters is adapted when energized to ignite fuel flowing from the burner with which it is associated.

The electric igniters **36, 38, 40** are connected in parallel circuit and the parallel circuit is connected across the secondary winding of a step down transformer **42**, the primary winding of which is connected to a source of electric energy here shown as line wires **L1, L2**.

Means are provided for controlling the supply of operative energy to the igniters and may take the form of a pair of switches **44, 46**. The switch **44** is connected in series with the primary winding of the transformer **42** and controls the energization thereof. The switch **44** thus controls the energization of the three igniters **36, 38, 40**. The switch **46** is connected in series with the oven pilot burner igniter **40** so that energization of the igniter **40** is under the control of both switches **44** and **46**. To insure immediate ignition of gaseous fuel flowing from the oven pilot burner **32**, an interlock is provided between the switches **44, 46** and the valve **30** that the valve **30** cannot be opened until the switches **44, 46** are closed to provide a supply of operative energy to the igniter **40** as will more fully appear.

The oven valve **30** and the switch **46** are also operatively associated with the oven door so that the valve **30** cannot be opened and the switch **46** cannot be closed until the oven door has been opened. This feature is clearly shown in Figs. 2–4 wherein the switch **46** is shown as comprising a fixed contact **48** juxtaposed to a movable contact **50** carried by a flexible arm **52** which is adapted to be flexed to move the contact **50** into engagement with the contact **48**. The inherent bias of the flexible switch arm **52** normally holds the contact **50** out of engagement with the contact **48** and switch operating means are provided for flexing the switch arm **52** and closing the contacts **48, 50**.

The switch operating means are here shown as comprising a cylindrical casing **54** provided with axially located apertures **56, 58** at each end and an axially extending slot **60** in the side wall thereof. A piston element **62** extends slidably through the apertures **56, 58** and has secured to the medial portion thereof by any suitable means a laterally extending thrust element **64** which projects through the slot **60** and alongside the flexible switch arm **52**. Acting between the casing **54** and the thrust element **64** is a spring **66** which serves to bias the thrust element **64** toward the flexible switch arm **52** and urges

the end 68 of the piston element 62 out of the casing 54 through the aperture 58.

As best shown in Fig. 4, the casing 54 is mounted in the range in the wall of the oven compartment 26 with the end 68 of the piston element 62 extending through a suitable aperture (not shown) in the front panel of the range so that it may be engaged by the oven door 70 when the same is in closed position. When the oven door is in closed position, the end 68 of the piston element 62 is maintained within the casing 54; the spring 66 is compressed; and the thrust element 64 is maintained out of engagement with the flexible switch arm 52. However, when the oven door is opened, (moved counterclockwise as viewed in Fig. 2) the piston element 62 is free to move under the bias of the spring 66 to the left as viewed in Fig. 2 until the thrust element 64 abuts the end of the slot 60. At the same time, the thrust element will engage the flexible switch arm and flex the same to move the contact 50 into engagement with the contact 48.

The switch 44, which controls the energization of the primary winding of the transformer 42, may comprise a fixed contact 72 engageable by a movable contact 74 carried by a flexible switch arm 76. The operating means for the switch 44 includes a cylindrical casing 78 provided with axially located apertures 80, 82 in the end walls thereof and an axially extending slot 84 in its peripheral wall. Slidably mounted in the aperture 80 is a piston element 86 which terminates in a plate 88 provided with a lateral extension 90 projecting through the slot 84 and alongside the flexible switch arm 76. A push button 92 is secured in any suitable manner to the plate 88 in axial alignment with the piston element 86 and slidably extends through the aperture 82 in the casing 78. A spring 94 acts between the casing 78 and the plate 88 and serves to bias the extension 90 of the plate 88 against the end of the slot 84. The dimensions of the slot 84 are such that the push button 92 will project from the casing 78 when the extension 90 of the plate 88 is in engagement with the end of the slot 84 as shown in Fig. 2.

As best shown in Fig. 4, the casing 78 is mounted on the range in such a manner that the push button 92 is easily accessible to an operator, the push button 92 extending through a suitable aperture (not shown) in the front panel of the range.

The operating means for the switches 44, 46 are operatively associated with the valve 30 which controls the flow of fuel to the oven burner 24 and of the pilot burner 32 so that the valve 30 may be opened only when the oven door 70 is in its open position and the switch operating means are positioned to close the switches 44, 46. The oven valve 30 may comprise a casing 96 having an inlet adapted for connection to the manifold 14 and a pair of outlets adapted for connection to the conduits 28, 34 respectively. The casing 96 contains the usual rotatable shut off cock (not shown) for controlling the flow of fuel to the conduits 28, 34 and may also contain a thermostatically controlled valve (not shown) for controlling the flow of fuel to the conduit 28 which is connected to the oven burner 24. Movement of the shut off cock between open and closed positions is effected by rotation of a shaft 98 having one end secured to the rotatable valve member and having the other end extending out of the casing 96, the other end of the shaft 98 terminating in the usual handle or knob 100. Rotation of the knob 100 is effective to move the shut off cock between open and closed positions and set the temperature to which the thermostatically controlled valve will respond in a manner well known in the art.

Mounted on the casing 96 is a pair of detent means for preventing rotation of the shaft 98 to move the shut off cock from closed to open position. These means may be of any suitable form and are here shown as comprising an annular plate 102 provided with a pair of diametrically opposed notches 104, 106 and securely mounted on the shaft 98 between the casing 96 and the knob 100.

A lug 108 formed on the casing 96 pivotally supports a bell-crank 110, one end of which is adapted to be movable through the notch 104 when the shaft 98 is in a position to close the valve 30. A spring 112 acting between the bell-crank 110 and the casing 96 biases the bell-crank 110 in a counterclockwise direction as viewed in Fig. 2 and tends to move the bell-crank 110 out of the notch 104 to the position shown in broken lines where it will be free of the plate 102.

Carried on the casing 96 on the side opposite the lug 108 is a second lug 114 on which is pivotally mounted a bell-crank 116 one end of which is adapted to be movable into the notch 106 when the shaft 98 is positioned to close the valve 30. A spring 118 acting between the casing 96 and the bell-crank 116 biases the bell-crank 116 in a clockwise direction as viewed in Fig. 2 and tends to position the one end thereof within the notch 106. It will be apparent that when the ends of the bell-cranks 110, 116 are positioned respectively within the notches 104, 106 the plate 102 and its associated shaft 98 are restrained from rotation and the shut off cock of the valve 30 cannot be moved to the fuel flow permitting position.

The position of the bell-crank 110 relative to the plate 102 is governed by a suitable pull wire or cable 120 one end of which is connected to the other end of the bell-crank 110 and the other end of which is connected to the piston element 86. A suitable tubular housing 122 may be provided for guiding the cable 120. The spring 94 is considerably stronger than the spring 112 and the length of the cable 120 is such that the cable 120 will be subjected to a tension sufficient to overcome the bias of the spring 112 and position the free end of the bell-crank 110 within the notch 104 when the piston element 86 is in its biased position and the valve 30 is closed.

Similarly the position of the bell-crank 116 is governed by a pull wire or cable 124 one end of which is connected to the other end of the bell-crank 116 and the other end of which is connected to the piston element 62. A suitable tubular housing 126 may be provided for guiding the cable 124. The spring 66 is considerably stronger than the spring 118 and the length of the cable 124 is such that the cable 124 will be subjected to a tension sufficient to overcome the bias of the spring 118 and position the bell-crank 116 in the broken line position as shown in Fig. 2 with the free end of the bell-crank 116 clear of the plate 102 when the piston element 62 is in its biased position.

Operation

If the various parts of the apparatus are in the positions shown in the drawings, and it is desired to produce a flame at the top burners 10 and 12, the valves 20, 22 are opened to permit fuel to flow to the top burners 10, 12. At the same time, the push button 92 is manually operated to move the piston element 86 against the bias of the spring 94 and carry the lateral extension 90 of the plate 88 into engagement with the flexible switch arm 76 of the switch 44 thereby flexing the same and moving the contact 74 into engagement with the contact 72. Upon closing of the contacts 72, 74 of the switch 44, the primary winding of the transformer 42 is energized through a circuit which may be traced as follows: from line wire L1, to wire 128, switch 44, wire 130, primary winding of the transformer 42, and wire 132 to line wire L2.

When the primary winding of the transformer 42 is energized, the secondary winding thereof will also be energized and the igniter 38 will be energized through a circuit which may be traced as follows: from one terminal of the secondary winding of the transformer 42 to wire 134, wire 136, resistor 138, wire 140, igniter 38, wire 142, and wire 144 to the other terminal of the secondary winding of the transformer 42. Similarly, igniter 36 will be energized through a circuit which may be traced as follows: from one terminal of the secondary winding

of the transformer 42 to wire 134, wire 146, resistor 148, wire 150, igniter 36, wire 152, and wire 144 to the other terminal of the secondary winding of the transformer 42.

When the igniters 36, 38 are energized, the current flowing therethrough will raise the temperature thereof sufficiently to ignite the fuel issuing from the burners 10 and 12. When ignition of the top burners 10, 12 is effected, the push button 92 may be released to permit the piston element 86 to move under the bias of the spring 94 to carry the lateral extension 90 of the plate 88 out of engagement with the switch arm 76 of the switch 44 and permit the inherent bias of the switch arm 76 to separate the contacts 72, 74 thereby deenergizing the primary winding of the transformer 42.

If it is desired to ignite the oven burner 24, the oven door 70 is moved to its open position as shown in Fig. 4. When the oven door 70 is moved to its open position (moved in a counterclockwise direction as viewed in Fig. 2), it is disengaged from the end 68 of the piston element 62 to release the piston element 62 for axial movement under the bias of the spring 66. Movement of the piston element 62 under the bias of the spring 66 will carry the thrust element 64 into engagement with the flexible switch arm 52 of the switch 46 to flex the same and move the contact 50 into engagement with the contact 48. At the same time, the spring 66 exerts a force on the cable 124 sufficient to overcome the bias of the spring 118 and move the bell-crank 116 in a counterclockwise direction as viewed in Fig. 2 to the broken line position wherein the bell-crank 116 is free of the notch 106 in the plate 102.

The push button 92 is now manually operated to move the piston element 86 against the bias of the spring 94 thereby closing the switch 44 and completing the hereinbefore described energizing circuit for the primary winding of the transformer 42. Movement of the piston element 86 against the bias of the spring 94 relieves the tension on the cable 120 and permits the spring 112 to move the bell-crank 110 in a counterclockwise direction as viewed in Fig. 2 to the broken line position wherein the bell-crank 110 is free of the notch 104.

The plate 102 is now free to be rotated and the knob 100 may be moved to position the valve 30 to admit fuel to the conduits 28, 34, and thus to the oven burner 24 and the pilot burner 32. Simultaneously with the release of the detent means, the switches 44, 46 are closed to complete an energizing circuit for the igniter 40 which includes the hereinbefore traced energizing circuit for the primary winding of the transformer 42 as well as a circuit which may be traced as follows: from one terminal of the secondary winding of the transformer 42 to wire 134, resistor 154, wire 156, igniter 40, wire 158, switch 46, and wire 144 to the other terminal of the secondary winding of the transformer 42.

Current flowing through the igniter 40 will raise the temperature thereof sufficiently to ignite fuel flowing from the pilot burner 32 and the flame at the pilot burner 32 will ignite fuel flowing from the oven burner 24.

It will be apparent that with the hereinbefore disclosed apparatus the valve 30 cannot be moved to the open position to permit fuel to flow through the oven burners until the oven door 70 has been opened to vent the oven compartment and the push button 92 has been operated to energize the igniter 40. Thus, it is impossible for the operator to open the valve 30 to admit fuel to the oven burner without taking the steps essential to a safe lighting procedure.

When a flame is established at the pilot burner 32, it will be visible to the operator through the usual window (not shown) in the oven wall since the oven door 70 is open and will serve as an effective signal that ignition has been accomplished. The push button 92 may then be released and the oven door 70 may be closed to effect a return of the piston elements 86, 62 and their associated detents toward their original positions. The bell-cranks 110, 116, will however, have no latching effect on the shaft 98 since the notches 104, 106 are no longer aligned therewith, having moved with the knob 100 when the same was rotated to open the oven valve. The knob 100 and shaft 98 will thus be free to move between controlling positions until returned to the "off" position where the bell-cranks 110, 116 will be moved into the notches in the plate 102 under the bias of the springs 94, 118 respectively.

It will be understood that while a schematic form of the invention has been shown and described herein, many changes in the details of construction and arrangement of parts may be made within the scope of the appended claims without departing from the scope of the invention.

It is claimed and desired to secure by Letters Patent:

1. In a control and ignition system for gas ranges having an oven and a burner for heating the oven, the combination comprising an oven door, valve means movable between positions for controlling the supply of gaseous fuel to the burner, detent means for holding said valve means in one of said positions and preventing said supply, an electric igniter for igniting the burner, means for energizing said igniter, switch means movable between open and closed positions for controlling the energization of said igniter, and means operatively associated with the oven door for closing said switch and conditioning said detent means to disengage said detent means from said valve means whereby said valve means is conditioned free from said detent means for movement to another of said positions when the oven door is opened.

2. In a control and ignition system for gas ranges having an oven, an oven burner and at least one top burner, the combination comprising an oven door, valve means movable between positions for controlling the supply of gaseous fuel to the oven burner, an electric igniter for the oven burner, a second electric igniter for the top burner, means for energizing said igniters, a switch movable between open and closed positions for controlling the energization of said igniters, manually operable means for actuating said switch, means cooperable with said manually operable means for controlling movement of said valve means between said positions, a second switch movable between open and closed positions for controlling the energization of said oven burner igniter, means cooperable with said oven door for actuating said second switch, and means operatively associated with said last named means for controlling movement of said valve means between said positions.

3. In a control and ignition system for gas ranges having an oven, an oven burner and at least one top burner, the combination comprising an oven door, valve means movable between positions for controlling the supply of gaseous fuel to the over burner, first and second detent means for holding said valve means in one of said positions for preventing said supply, an electric igniter for the oven burner, a second electric igniter for the top burner, means for energizing said igniters a switch movable between open and closed positions for controlling the energization of said first and second igniters, manually operable means for actuating said switch and releasing said first detent means, a second switch movable between open and closed positions for controlling the energization of said oven igniter, operating means cooperable with said oven door to be moved thereby when the oven door is moved between open and closed positions, said operating means being operatively associated with said second switch and said second detent means for closing said second switch and releasing said second detent means when said oven door is moved to open position, said valve means being free to move to another of its said positions upon release of said first and second detent means.

4. In a control and ignition system for gas ranges having an oven and a burner for heating the oven, the com-

bination comprising an oven door, an electric igniter for igniting the burner, means for energizing said igniter including manually operable means movable between positions for controlling the energization of said igniter, valve means movable between positions for controlling the supply of gaseous fuel to the burner, detent means for holding said valve means in one of said positions and preventing said supply, and means operatively associated with said oven door and said manually operable means for conditioning said detent means to release said valve means for movement to another of said positions when said oven door is opened and said manually operable means is in a position to energize said igniter.

References Cited in the file of this patent

UNITED STATES PATENTS

821,633	Graves	May 29, 1906
965,162	Dearborn	July 26, 1910
1,971,704	Castonguay	Aug. 28, 1934
2,334,603	Brumbaugh et al	Nov. 16, 1943
2,505,596	Weiler	Apr. 25, 1950
2,510,624	Forshey et al	June 6, 1950
2,513,051	Ray	June 27, 1950
2,619,952	Hardy et al	Dec. 2, 1952