Oct. 16, 1934. A. T. SCHMIDT 1,977,150

AUTOMATIC LIGHTER AND GAS CUT-OFF

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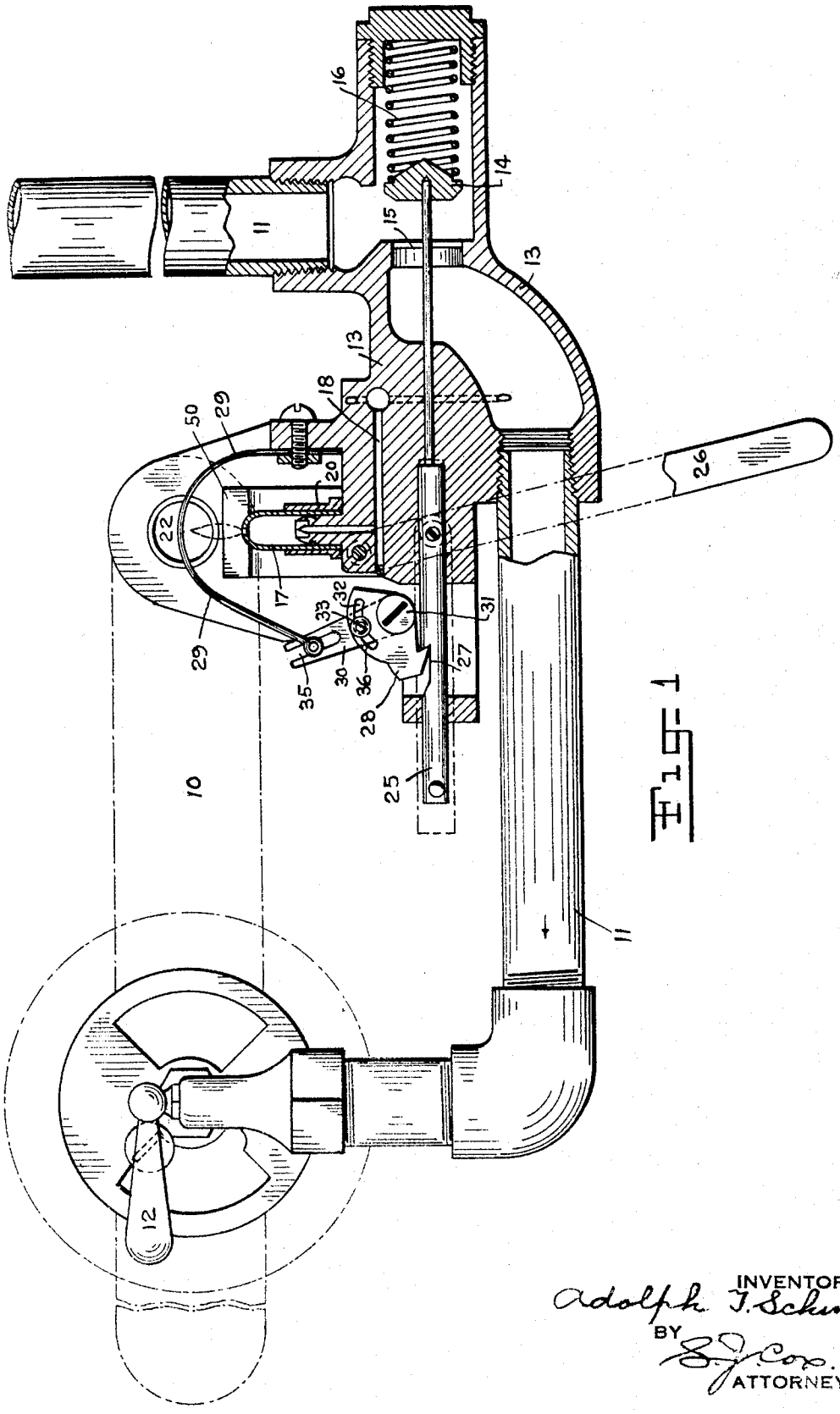


FIG. 1

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FIG. 2

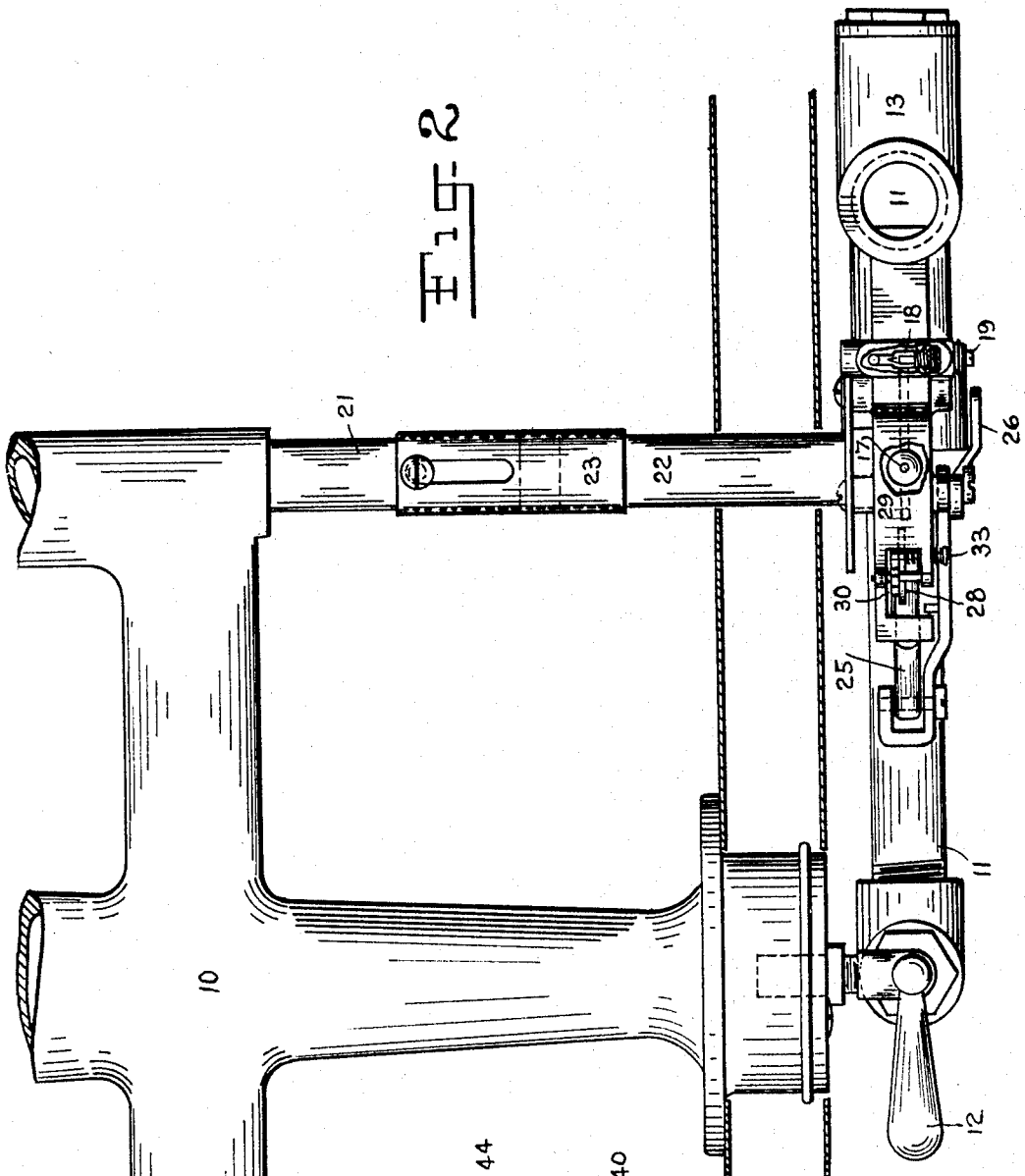
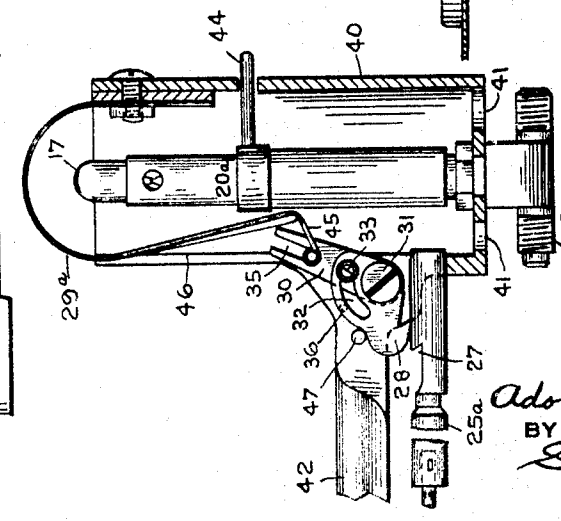


FIG. 5



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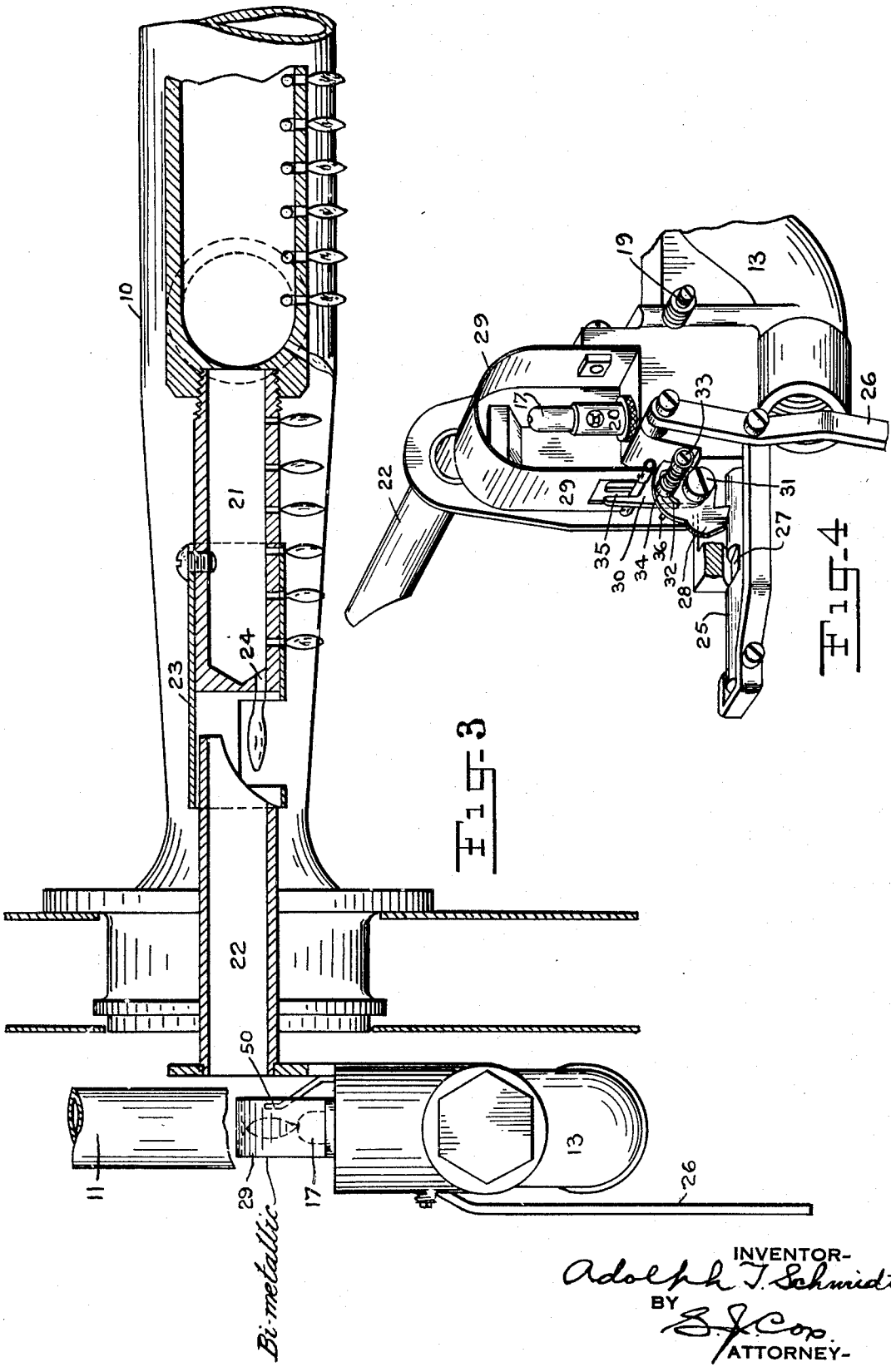


FIG-3

FIG-4

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UNITED STATES PATENT OFFICE

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AUTOMATIC LIGHTER AND GAS CUT-OFF

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Application October 2, 1931, Serial No. 566,525

7 Claims. (Cl. 158—117.1)

The present improvements relate, in general, to fuel control devices, and more particularly to automatic mechanism for lighting gas burners, as well as for controlling the supply of fuel thereto.

A primary object, among others, of the improvements, is to provide a novel fuel cut-off mechanism for gas burners. A further object, is to provide an improved mechanism for insuring the shutting off of the supply of gas should the pilot burner become extinguished. The provision of such a device which is quick-acting and dependable constitutes a further object of the improvements.

Another object is to provide an improved automatic ignition device for oven burners, which insures lighting of the oven burner, and will cause re-ignition thereof in the event that the burner is inadvertently extinguished. The provision of an improved lighter for ovens, in combination with a positive cut-off mechanism for the oven burner constitutes a further object of the invention.

Other objects include the provision of mechanism of the type indicated having novel elements and arrangement of parts, which will be apparent upon reference to the accompanying specification and drawings in which—

Fig. 1 is a side view of one form of the improvements, certain parts being in section;

Fig. 2 is a top plan view of the parts shown in Fig. 1;

Fig. 3 is an end elevation, partly in section, of the parts illustrated in Fig. 2;

Fig. 4 is a perspective view, with certain parts broken away or omitted, of the improved pilot burner and fuel cut-off mechanism;

Fig. 5 is a side elevation, with parts removed, illustrating a modified form.

Referring to the drawings, the embodiment of the improvements illustrated in Figs. 1 to 4, is shown in association with oven burner 10 which is supplied with gaseous fuel through conduit 11 having the usual manually operated valve 12, by which the burner is turned on or off by the user. Interposed in the supply conduit 11, at any convenient location, is a pilot burner 17 for the main burner 10 and a safety valve cut-off device. These elements may be mounted on the valve body 13, forming part of conduit 11, which is controlled by the valve 14, the latter being constantly urged toward seat 15 by spring 16.

The pilot burner 17 is supplied with fuel through conduit 18, the quantity thereof being controlled by means of adjusting screw 19. As illustrated, the pilot burner is provided with the usual adjustable air mixer sleeve 20, whereby air may be admitted for mixture with the gas for insuring a constant blue flame. Referring to Figs. 2 and 3, the main oven burner 10 is provided with an auxiliary burner tube 21 extending in the direction of pilot burner 17. A gas conducting tube 22 is mounted on the valve body 13, in fixed relation to pilot burner 17, and extends towards tube 21. A removable sleeve 23, maintains tubes 21 and 22 in alignment, with the jet orifice 24 of tube 21 directed into tube 22. It is evident upon inspection of Fig. 3, that the tubes 21 and 22 are aligned with the flame of pilot burner 17. This fixed position of orifice 24 relative to the pilot burner, is always definitely maintained, due to the fixed position of tube 22 and the provision of sleeve 23. While this sleeve insures the proper relation of these parts, the burner 10 may readily be removed, without disturbing tube 22 or the pilot burner, by loosening the set screw and retracting the sleeve 23 (Fig. 2). The pilot burner and tube 22 may then remain in position, while burner 10 is removed or replaced.

Mechanism for controlling the main gas supply valve 14, is illustrated in association with the pilot burner 17. This arrangement includes a manually operated rod 25 connected to valve 14, and movable against the action of spring 16 by forcing handle 26 to the right (Fig. 4). The rod 25 is provided with a notch or recess 27 adapted to receive a detent 28, whereby valve 14 may be held open without the necessity of holding handle 26.

A thermally responsive element 29 is provided for actuating detent 28, and this element, as illustrated, preferably comprises, although not necessarily, a U-shaped member disposed over the pilot burner 17. One end of said element 29 is anchored to the valve body 13 while the other end is free to move in response to expansion or contraction due to the temperature condition of burner 17.

Movement of the thermal element 29 is transmitted to detent 28 by means of a clutch device which insures quick and prompt initial movement of the detent in response to changes of temperature. While such a clutch device may take numerous forms, that illustrated has proved to be very efficient under actual operating conditions. A lever 30 is pivoted on the same pin 31 with detent 28, although independently thereof. The detent 28 is provided with a slot 32 to accommodate a pin 33 which is mounted on lever 30 and projects through the slot. The lever and detent are thus free to move relative to each other, to

the extent permitted by the slot 32. These elements may move in unison, by the provision of spring pressed collar 34, surrounding pin 33 and constantly bearing against the face of detent 28 along slot 32. A collar fixed at the end of the pin 33, serves to retain the spring and collar 34 in position. The face of lever 30 (Fig. 4) is thus frictionally held against the rear face of detent 28, so that the two members may move together, due to the frictional grip exerted. Should one of said members be arrested in its travel, the frictional grip may be broken, and the other may continue to move on, relative to the one which was stopped.

As illustrated, the free end of thermal element 29, is disposed in a slot 35 in lever 30, whereby the latter is moved by the thermal element. It will be seen, upon reference to Fig. 1, that movement of lever 30 and detent 28 in a clockwise direction, is limited by the face of valve body 13. The counter clockwise movement of the detent is obviously limited by the notch in rod 25, while lever 30 is free to move in a similar direction until it engages lug 36 projecting from the rear face of detent 28, or encounters the end of slot 32.

Upon reference to Fig. 5, a similar but slightly modified form may be observed. Although it may be employed with an oven or other type of burner, it is illustrated for use with a cluster of top burners, such as illustrated in the co-pending application of W. C. Lindemann and myself Serial No. 459,298, filed June 5, 1930. In this form, the pilot burner 17, supplied with fuel through conduit 18*a*, is disposed in the housing 40, having air ports 41. The housing is supported by bracket 42, extending from the fuel manifold (not shown), in the manner illustrated in said co-pending application. The air mixer sleeve 20*a*, for burner 17, is rotatable by means of arm 44, extending through a slot in the housing. The thermal element 29*a*, anchored at one end to the housing 40, has its free end directed inwardly toward the center of the housing, although a portion 45 is bent outwardly at an angle and is disposed in slot 35 of lever 30. This side of housing 40, is cut away slightly at 46 to afford freedom of movement, for thermal element 29*a* and the members moved thereby. The elements of the frictional clutch and detent are the same as in the form first described. A pin 47 is provided on bracket 42 to limit clockwise movement of latch or detent 28. The valve rod 25*a* is adapted to be manually operated in the manner described with respect to rod 25, and carries at its free end a valve (not shown) similar to valve 14, for controlling the manifold which supplies fuel to the top burners (not shown). As this relation of parts is clearly illustrated in said co-pending application, it is not repeated here.

The operation of the improvements may be apparent from the foregoing description. Upon reference to the form illustrated in Figs. 1 to 4, the organization will be seen in cool position in Fig. 4, in which condition the valve 14 is held closed by spring 16, thereby cutting off the supply of fuel of conduit 11, to oven burner 10 and pilot burner 17, whether valve 12 is manipulated or not. In order to light the burner 17 and set the device for use, the lever 26 is manually moved to the right, from the position of Fig. 4 to that of Fig. 1, whence rod 25 moves in a like direction, retracting valve 14 against the urge of spring 16, thereby opening conduit 11, so that fuel is available for the burners. While an attendant is thus holding open valve 14 by means of handle 26, a match is applied to pilot burner 17, which becomes lighted. This slight heating of thermal element 29 causes latch or detent 28 to be moved into notch 27, whereby rod 25 and valve 14 are held open, and the attendant may release his hold on handle 26. Nothing further is required of the attendant in setting the device.

Upon such initial heating of the thermal element 29, the free end moves outwardly and consequently moves lever 30 in a counter clockwise direction. At this time the notch 27 is aligned with latch or detent 28, so that there is nothing to obstruct the travel of the latter. Therefore, the movement imparted by thermal element 29 to lever 30, is transmitted to detent 28, which moves in unison with lever 30, due to the frictional grip between the two elements. This movement transpires speedily and in response to the initial heating of the thermal element. The application of the latch 28 to notch 27, thereby takes place at the very beginning of the setting operation, so that very little time of an attendant is required.

When latch 28 enters notch 27, it encounters the body of rod 25, and its movement is therefore arrested. However, complete expansion of thermal element 29 has not taken place, so that the increasing heat of the burner flame causes further spread of element 29, whereupon lever 30 is likewise further impelled to the left (Figs. 1–4). Since there is a frictional connection between lever 30 and detent 28, this grip is broken and the former moves on relatively to the latter. This movement of the lever relative to the detent, continues until lever 30 engages pin 36 or the end of slot 32 in the detent 28. At this point the relative movement is arrested, but continued expansion of thermal element 29, causes lever 30 to depress and hold latch 28 down with increasing intensity, thereby functioning in the nature of a lock. Should continued expansion of element 29 occur, the free end thereof may ride up in slot 35. So long as pilot burner 17, is ignited, the parts will remain in the position illustrated in Fig. 1, in which state the burners are in condition for use. Attention is invited to the fact that, although the valve is latched open in the early stages of the set operation, the continued movement of the parts, comprises an automatic setting in which the parts move themselves into the most advantageous position, when an emergency arises necessitating closing of the valve.

Assuming now that the pilot burner is inadvertently extinguished, the initial cooling effect or contraction of thermal element 29 will at once be transmitted to lever 30 and latch 28, which will immediately move in unison and withdraw the latch from notch 27, whereupon spring 16 will close valve 14, so that no fuel can reach burners 10 or 17. It is notable that the movement attending the initial cooling of element 29 is transmitted to lever 30 and thence, through the frictional grip, to detent 28, which is quickly moved in clockwise direction. This initial movement is magnified due to the mechanical advantage obtained from the relative positions of parts 28 and 30. In the heated position of these parts, the lever 30 has a position closer to the nose of latch 28 and therefore a "bell crank" lever is formed, due to the purchase occasioned by the frictional grip, so that they move in unison and move quickly, due to the increased leverage attained. It will be remembered that this relation of parts was assumed when the device was originally set and the burner 17 was lighted, so that a quick removal of the latch 28 could be effected, when the emergency arose.

Having accomplished the quick removal of the detent 28, the parts continue to move so as to place themselves in the most favorable position for travel in the opposite direction. The most favorable position in a slip clutch structure is one in which the greatest mechanical advantage is obtained in the leverage system. Since the relation of parts changes from time to time due to the slip clutch, it is obvious that the mechanical advantage is altered. Accordingly, when the parts come to rest after one operation they repose in a position having the best mechanical advantage for incepting movement in an opposite direction. Accordingly, continued cooling and contraction of element 29, causes lever 30 and detent 28 to move in a clockwise direction until the latter is arrested in its movement by engagement with valve body 13 (Fig. 1) or with stop 47 (Fig. 5). Continued movement of lever 30, breaks the frictional connection with detent 28, so that the former moves on until the end of slot 32 is encountered or until element 29 ceases to contract. Having reached this position, it is notable that the relation of parts 28 and 30 is quite different from their relation at the beginning of the movement. Their present position is again the most advantageous for quickly moving detent 28 into notch 27 when occasion requires. Here the mechanical advantage and increased leverage, is attained through automatic setting of the parts. A comparison of parts 28 and 30 in the cool position (Fig. 5) and in the heated position (Fig. 1) will emphasize the advantages attained by having the parts all set for a subsequent counter movement. The present improvements do not merely provide for the application and release of a detent but actually function afterwards to set themselves for subsequent contingencies.

Should it be desired to increase or diminish the purchase or frictional grip between elements 28 and 30, the spring pressed collar 34 may be appropriately adjusted, by adjusting pin 33 which has screw threaded engagement with lever 30.

It is notable in all forms of the improvements, that the clutch device compensates for variations in the thermal properties of the elements 29. For example, certain stock from which the elements 29 are stamped may respond differently to changes of heat and cold. Elements from other stock may likewise be non-uniform. With the present device, the slip clutch compensates for such differences, since the movement of the latch takes place instantly and immediately with a change in temperature. As previously seen, it is not necessary to wait, to have the thermal element completely heated up, because partial and initial heating is sufficient to perform the service. The remainder of the expansion and contraction of the element takes place afterwards. Accordingly the movement of the latch 28, is not dependent upon the character of the element 29. Furthermore, the necessity of adjustment of the thermal element, at the time of manufacture is eliminated, for the reasons noted above.

The functioning and operation of the structure of Fig. 5, is similar to that described with respect to the other form. However, the outwardly projecting arm 45 of element 29*a*, contributes to making the arrangement more sensitive.

When the pilot light 17 is burning, the organization is in condition for use, and the oven burner 10 may be lighted without the use of a match. Valve 12 may now be opened, and fuel is admitted to the burner chamber, whence it enters tube 21 and issues from jet 24 (Fig. 3) directly into tube 22. When this fuel approaches the pilot light, a flame is propagated back through tube 22, whereupon jet 24 becomes ignited, and the other orifices of tube 21 become lighted. A flame is thus carried to the orifices of the main burner 10, which immediately becomes ignited. The burner will remain lighted so long as valves 12 and 14 remain open.

Should the burner 10 become inadvertently extinguished, as by a draft of wind, with the valves 12 and 14 open, the pilot burner 17, will immediately and automatically cause reignition of the burner 10. This is accomplished in the same manner, as described above, wherein fuel issuing from jet 24, was ignited by burner 17, and a flame flashed back to the burner orifices. If, however, the burner 17 is also extinguished, then the valve 14 will be immediately and automatically closed and the fuel shut off, and no unconsumed and harmful fuel can escape from either burner.

It is notable that the lighting of the oven burner is positive and certain due to the close relation of the pilot 17 to the burner 10. Furthermore, there is no chance for failure of ignition since sleeve 23 is provided and insures proper alignment of orifice 24 with tube 22 at all times. In order to protect the pilot burner 17, a shield 50 is provided so that a sudden rush of fuel from orifice 24 will not extinguish same.

It is understood that all of the forms illustrated may be employed with oven or top burners. That shown in Fig. 5 however, is intended for use with a cluster of top burners, from each of which a flash tube is provided extending to the pilot burner after the manner revealed in the said co-pending application. Accordingly, ignition and re-ignition of said burners is accomplished in a manner similar to that described with respect to burner 10.

It will be apparent that the present improvements, provide a safe and quick lighter for ovens, as well as a positive and quick shut off device. This positive lighting may be attributed to the novel and improved relationship between main and pilot burners. The improvements further provide a positive setting of the shut off valve when the pilot is lighted as well as a quick and positive closing of the valve when the light is extinguished. It is furthermore notable that the device is simple in construction and operation, inexpensive to manufacture and maintain. Little or no human attention is required to operate the device, since it is almost entirely automatic.

Various modifications within the scope of the present improvements may occur to those skilled in the art and may be adopted without departing from the scope and purview of the invention.

I claim:

1. In an automatic fuel control device, a quick action valve actuating mechanism comprising a pivoted detent, a thermal element, a slot and pin frictional device operatively connecting said detent and element, said device affording movement of said detent by said element and also affording independent movement of said elements.

2. In an automatic fuel control device, a quick action valve actuating mechanism comprising a pivoted detent, stop means limiting the movement of said detent, a thermal element, and a clutch connection between said element and detent.

3. In combination, a main burner, a fuel supply conduit therefor, a valve for said conduit, spring means normally urging said valve in closed direc-

tion, a manually operated rod operatively connected to said valve for temporarily holding same open, a pivoted detent for engaging said rod for releasably holding said valve open, a pilot burner, a thermal element in heat receiving relation therewith, a releasable connection between said element and detent, whereby initial heating of said element will move said detent into engagement with said rod and upon further heating, said element will move relative to said detent to a position for affording quick withdrawal of said detent upon cooling of said element.

4. Fuel control mechanism comprising a burner, fuel supply means therefor, a valve for controlling said supply, energized means for urging said valve in closing direction, a detent for holding said valve open, a rock-arm mounted for arcuate travel relative to said detent, means releasably connecting said detent and arm, and a thermally responsive member exposed to said burner and mounted for imparting movement to said arm.

5. Fuel control mechanism comprising a burner, fuel supply means therefor, a valve for controlling said supply, energized means for urging said valve in closing direction, a pivoted detent for holding said valve open, an arm pivoted for movement relative to said detent, means releasably connecting said detent and arm, and a thermal member exposed to the heat of said burner for moving said arm.

6. Fuel control mechanism comprising a burner, fuel supply means therefor, a valve for controlling said supply, energized means for urging said valve in closing direction, a detent for holding said valve open, a rock-arm mounted for arcuate travel relative to said detent, means releasably connecting said detent and arm, a thermal member in heat receiving relation to said burner for actuating said arm and a lost motion connection between said thermal member and arm.

7. Fuel control mechanism comprising a burner, fuel supply means therefor, a valve controlling said supply, a spring for urging said valve in closed direction, a rod secured to said valve, a manually operated handle attached to said rod for opening said valve against the action of said spring, a detent for engaging said rod when the valve is opened, a member mounted independently of said detent, a frictional connection releasably joining said detent and member whereby movement of the latter is transmitted to the former, a thermally responsive element positioned for being heated by said burner, and a connection between said element and member.

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