

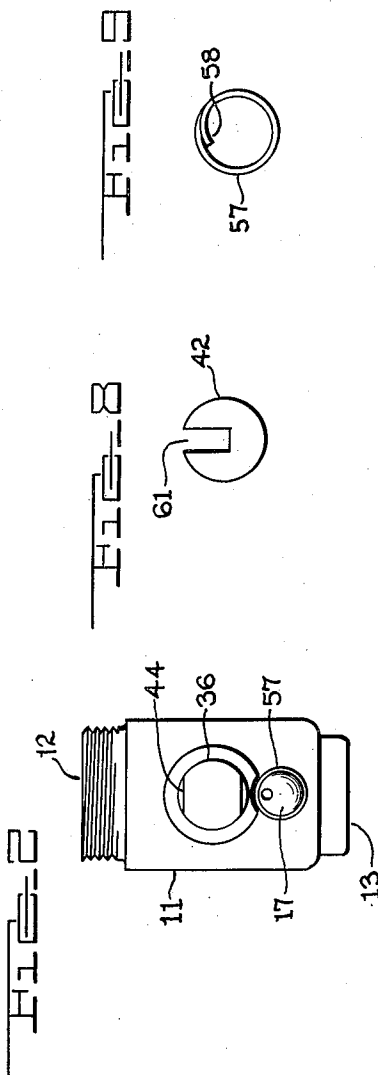
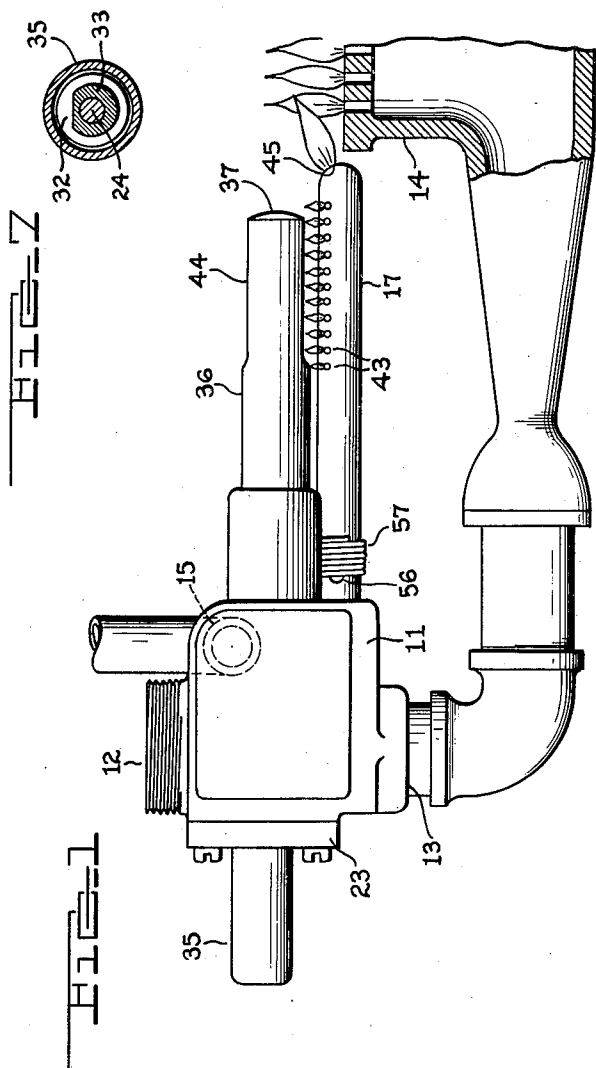
Feb. 28, 1950

R. E. NEWELL
GAS SAFETY BURNER

2,499,073

Filed Oct. 10, 1947

3 Sheets-Sheet 1



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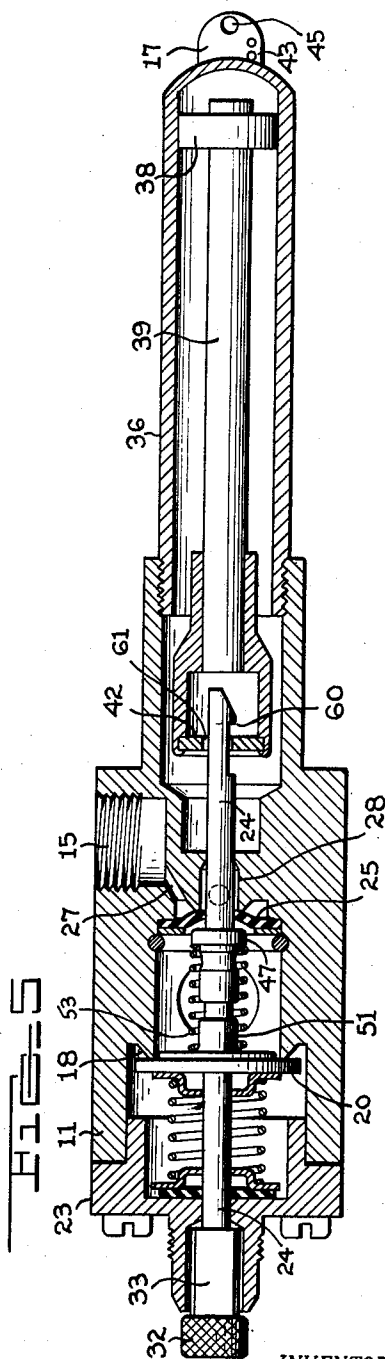
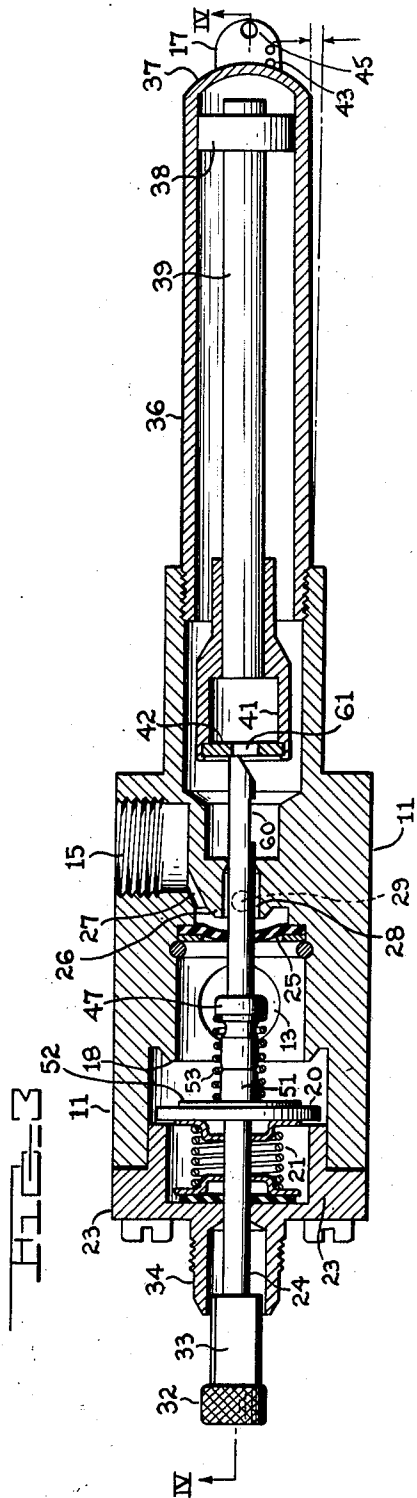
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GAS SAFETY BURNER

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11 Claims. (Cl. 158—117.1)

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This invention relates to safety controls for gas burners, and more particularly to a device for controlling the operation of a valve that supplies gas to a main burner and a valve that controls supply of gas to a pilot burner.

Among the rules of the American Gas Association is one that requires automatic shutting off of gas supply to burners, upon blowing out of a flame or failure in gas supply. This 100% safety feature is especially desirable where bottled gases such as propane and butane are used.

Gas supply valves, which are automatically opened to provide for flow of gas to a burner, are frequently inadequate to provide for full flow to the burner, while with manually-operable valves there is danger that the operator will open the valve for flow of gas to the main burner before the pilot is lit or other steps taken to ignite the gas at the main burner. This, of course, is a dangerous condition.

One object of my invention is to provide means for not only automatically cutting off flow of gas to a main burner and a pilot burner, upon extinguishment of the pilot flame for any reason, but also to prevent the re-establishment of a flow of gas to a main burner until after the pilot burner has been lit.

Another object of my invention is to provide a main gas-supply valve that can be manually operated to provide a desired full flow of gas to a main burner, but which valve is controlled by a thermally-responsive device in such manner that it cannot be opened until after a pilot burner has been lit.

Still another object of my invention is to provide for control of a gas valve or valves by a tubular thermally-responsive element to one side of which gas flames will be applied to provide for flexing of the tube, the tube walls at zones or areas removed from the flame-contacting wall of the tube being of reduced thickness so that not only will the tube be flexed in a lateral direction more readily, but there is reduced heat conductivity from the flame side to the opposite side.

In the accompanying drawings, Figure 1 is a side elevational view of a gas control device applied to a burner; Fig. 2 is an inner end view of the device of Fig. 1; Fig. 3 is a sectional plan view on an enlarged scale of the device of Fig. 1 and taken on the line III—III of Fig. 4; Fig. 4 is a view taken on the line IV—IV of Fig. 3; Fig. 5 is a view showing certain of the operating parts of Fig. 3 in the positions occupied by them when the flow of gas to the burner and the pilot

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is shut off; Fig. 6 is a view showing the combined valve stem and latch bar of Figs. 3 and 4, with certain of its associated elements; Fig. 7 is a view taken on the line VII—VII of Fig. 4; Fig. 8 is a face view of the trip plate of Fig. 4; Fig. 9 is an end view of the air mixing valve of Fig. 4, for the pilot burner tube; Fig. 10 is a view taken on the line X—X of Fig. 4, and Fig. 11 shows a modification of the structure of Fig. 4.

The apparatus comprises a valve casing 11 having an inlet 12 and an outlet 13 through which gas is supplied to a main burner 14. The casing is also provided with an inlet 15 and an outlet 16 through which gas is directed to a pilot burner 17.

A main valve seat 18 is provided in the valve body 11 and a valve 20 cooperates therewith to control flow of gas to the main burner 14. The valve 20 is yieldably urged toward its seat by a spring 21 that is interposed between a sealing washer 22 in a cap 23 and the disc 20. The disc 20 is slidably supported upon a valve stem 24, which serves also as a latch bar in a manner to be hereinafter described. A flexible valve disc 25 cooperates with an annular valve seat 26 to control flow of a supply of pilot-burner gas from the inlet 15 through a port 27, a port 28 and a port 29 to the outlet at 16 where it passes through an orifice member 31 into the pilot tube 17.

The valve stem 24 projects from the rear side of the casing 11 and has a pull-button 32 rigidly secured thereto. The pull-button has a tubular extension 33 that is flattened on its upper side as shown more clearly in Fig. 7, such flattened area engaging with a flattened surface on a tubular extension 34 of the cap 23, so that the valve stem will be held against any rotative movement. The extension 34 is threaded to receive a protective and covering bonnet 35 which is removed whenever there is occasion to manually operate the valve stem.

A tube 36 of a material which is readily responsive to temperature changes has threaded connection with the valve body 11, and at its outer end is closed by a cap 37 that is welded thereto. A collar or ring 38 is rigidly secured in the tube and in turn rigidly supports one end of a rod 39. The rod 39 has rigidly secured thereto a member 41 of generally bell-shape that supports a combined trip and latch plate 42 welded to the end of the member 41.

When one side of the thermally-responsive tube 36 is heated by flames from jet openings 43 in the tube 17, the outer end of the tube will shift or flex laterally, thus swinging the rod 39 and

hence shifting the plate 42 in a generally radial direction. To facilitate this movement of the tube under temperature changes, the top and bottom walls thereof are thinned as shown at 44. Such reduced section not only makes the tube more flexible, but retards the transmission of heat by conduction from the flame-engaged side of the tube to the opposite side thereof, thereby making the tube more readily responsive to the flames at the jets 43, as indicated by the broken lines in Fig. 3.

When the movable parts of the apparatus occupy the positions shown in Figs. 3 and 4, there is flame present at the jets 43 and at the pilot jet 45, and the forward end of the valve stem 24 is in abutting engagement with the plate 42; and the valves 20 and 25 are being thereby held open. A thimble 47 which is circumferentially depressed at 48 into an annular recess 49 in the stem and therefore is non-slidable on the rod, abuts against a thimble 51 that is provided with a flange 52 and is slidable on the valve stem. When the valve stem is drawn outwardly by its button 32 to compress a light expansion spring 53 between the thimbles 47—51 and to bring the thimble 47 against the thimble 51, further movement will pull the valve 20 from its seat 18 thus permitting flow of gas to the main burner 14. At this time, the valve 25 for the pilot gas is also being held in open position as hereinafter explained.

The valve 25 is of flexible material such as rubber and has frictional engagement with the valve stem 24 so that it will be flexed through longitudinal shifting of the stem. It is held in place in the valve casing by a washer 54 and a split ring 55 that has snap fit with a groove in the valve body.

Air for mixture with the gas that enters the pilot tube 17 is supplied through an opening 56 in the side of the tube. A coil 57 that is slidable on the tube serves as a valve for regulating the amount of air that will enter through the opening 56, the valve coil being adjusted longitudinally of the pilot tube in accordance with the amount of air desired. One end of the coil 57 is bent inwardly at 58 (Fig. 9) and has a sharp edge or corner that will bite somewhat into the tube 17, so that the coil will be held against accidental movement.

In case of the failure in gas supply or extinguishment of the pilot burner, with consequent extinguishment of the flame jets at 43, the tube 36 will become cool and will return to its original position, which movement shifts the rod 39 and the plate 42 a sufficient distance to move the plate out of abutting engagement with the inner end of the rod 24, thereby allowing the spring 21 to push the rod inwardly and to move the valve 20 to its seat. This movement of the rod or valve stem 24 also moves the valve disc 25 against its seat 26. Flow of gas to the main burner and also to the pilot tube 17 is thereby automatically shut off.

This movement of the rod carries its latch-like extension 60 through a slot 61 in the plate 42, to the position shown in Fig. 5. At this time, the spring 53 yieldably holds the rod 24 in its foremost projected position and the thimble 47 is spaced inwardly from the thimble 51.

If now it is desired to again light the main burner, the protective bonnet 35 will be removed, whereupon the valve stem 24 will be pulled outwardly, but the distance of outward movement will be limited by engagement of the latch shoulder at 60 with the plate 42. This movement, how-

ever, is sufficient to move the valve disc 25 from its seat and allow gas to flow to the pilot tube 17. The movement is not sufficient, however, to move the valve 20 from its seat, and the spring 53 is weaker than the spring 21.

The jets of the pilot tube can then be lit. In a few seconds, the thermally-responsive tube 36 will become heated on one side sufficiently to cause it to flex to a degree that will release the plate 42 from the latch 60. The valve stem 24 can then be manually pulled outward, to open the valve 20, for a full supply of gas to the main burner, the thimble 47 being brought into engagement with the thimble 51 during this movement, to move the valve 20 from its seat. This expansion of the tube will result in the shifting of the rod 39 and its plate 42 to a position at which the inner end of the rod 24 will again have abutting engagement with the plate 42 as in Fig. 3.

This control unit can be used in connection with a manually or thermally operated valve in a gas line (not shown) that leads to the valve body inlet 12.

In Fig. 11, I show a modification of the structure of Fig. 4, in that there is no automatically-operated valve for controlling flow of gas to the pilot burner. This cheaper and simpler structure will be permissible where the less explosive gases of lower B. t. u. value, such as ordinary natural or city gas, are used.

In the structure of Fig. 11, pilot gas is admitted through a port 65 and the orifice member 31 into the pilot tube 17. The valve disc 25 and the associated ports of Fig. 4 are omitted, but otherwise the structure will be the same as in Fig. 4; and the valve stem 24 cannot be moved a distance sufficient to open the gas valve 20, until after the jets of the pilot burner tube 17 have been lit.

I claim as my invention:

1. Control apparatus, comprising a main valve for controlling flow of gas to a main burner, a spring yieldably urging the valve to its closed position, a pilot burner in the form of a tube having flame jet openings, a thermally-responsive tube in position to be heated on one side by the flame jets, a second valve for controlling flow of gas to the pilot burner tube, a valve stem for holding the second valve closed when the stem is in a forwardly-projected position, a spring-pressed member yieldably urging the stem to its forward position, a lost-motion connection between the stem and the main valve for pulling the main valve in an opening direction when the stem is being retracted beyond the point at which the second valve has been opened, and means actuated through heating of the thermally-responsive tube on said one side, for holding the valve stem in its retracted position and for releasing the stem upon cooling of said side.

2. Control apparatus, comprising a main valve for controlling flow of gas to a main burner, a spring yieldably urging the valve to its closed position, a pilot burner having flame jet opening, a thermally-responsive element in position to be heated by the flame jets, a second valve for controlling flow of gas to the pilot burner, a valve stem for holding the second valve closed when the stem is in a forwardly-projected position, a spring-pressed member yieldably urging the stem to its forward position, a lost-motion connection between the stem and the main valve for pulling the main valve in an opening direction when the stem is being retracted beyond the point at which the second valve has been opened, and means actuated through heating

of the thermally-responsive element, for holding the valve stem in its retracted position and for releasing the stem upon cooling of said element, the said means serving also to limit retractive movement of the stem under manually-applied force, to a point at which only the second valve can be opened, while the element is cold.

3. Control apparatus, comprising a main valve for controlling flow of gas to a main burner, a spring yieldably urging the valve to its closed position, a pilot burner in the form of a tube having flame jet openings, a thermally-responsive tube in position to be heated on one side by the flame jets, a second valve for controlling flow of gas to the pilot burner tube, a valve stem for holding the second valve closed when the stem is in a forwardly-projected position, a spring-pressed member yieldably urging the stem to its forward position, a lost-motion connection between the stem and the main valve, for pulling the main valve in an opening direction when the stem is being retracted beyond the point at which the second valve has been opened, a trip rod in the thermally-responsive tube, positioned to abut the forward end of the valve stem when the tube side is hot, to hold the stem in retracted position, with the main valve and the second valve open, the rod being released from the stem upon reflexing of the tube through cooling of its said side.

4. Control apparatus, comprising a main valve for controlling flow of gas to a main burner, a pilot burner, a second valve for controlling flow of gas thereto, a valve stem for operating said valves, means yieldably urging said stem to a projected position at which the valves are closed, a thermally-responsive device operable to hold the stem in retracted position and the valves open, when the device is subjected to heat at the pilot burner and to release the stem when the device becomes cold, and means for releasably limiting retractive movement of the stem from its foremost position, to a point at which only the second valve is opened, and releasing the stem for full retractive movement upon heating of said device.

5. Control apparatus, comprising a valve chamber, a main valve therein for controlling flow of gas through the chamber to a main burner, a pilot burner, a second valve in the chamber, for controlling flow of gas from the chamber to the pilot burner, a valve stem for operating said valves, means yieldably urging said stem to a projected position at which the valves are closed, a thermally-responsive device operable to hold the stem in retracted position and the valves open, when the device is subjected to heat at the pilot burner and to release the stem when the device becomes cold, the said device comprising a tube communicating at one end with the valve chamber and gas tight otherwise, and also having one side exposed to flame at the pilot burner, in a generally vertical plane, those portions of its walls extending to the other side thereof being thinner than the first-named sidewall, to reduce the rate of heat transmission.

6. Control apparatus, comprising a valve chamber, a valve therein for controlling flow of gas to a burner, a thermally-responsive tube communicating at one end with the valve chamber and gas tight otherwise, and also having operative connection with said valve, and a burner positioned to heat one side of said tube, the tube being flexed through heating and cool-

ing thereof, to thereby control valve movements, and the tube being of thicker wall section at that area which is engaged by the burner flame than at other areas thereof.

7. Control apparatus, comprising a main valve for controlling flow of gas to a main burner, a spring yieldably urging the valve to its closed position, a pilot burner in the form of a tube having flame jet openings, a thermally-responsive tube in position to be heated on one side by the flame jets, a second valve for controlling flow of gas to the pilot burner tube, a valve stem for holding the second valve closed when the stem is in a forwardly-projected position, a spring-pressed member yieldably urging the stem to its forward position, a lost-motion connection between the stem and the main valve for pulling the main valve in an opening direction when the stem is being retracted beyond the point at which the second valve has been opened, a relatively weak spring at said connection, for projecting the stem further forwardly upon closure of the main valve, means actuated through heating of the thermally-responsive tube on one side, for holding the valve stem in its retracted position and for releasing the stem upon cooling of said side, and a latch device engageable when the stem is at its foremost projected position, to limit retractive movement of the stem under manually applied force, to a point at which only the second valve can be opened while the tube is cold, the latch being released upon heating of the tube.

8. Control apparatus, comprising a valve body, a main valve therein for controlling flow of gas therethrough to a main burner, a spring yieldably holding the valve in its closed position, a thermally-responsive tube carried by said body and projecting forwardly therefrom, a trip rod in the tube and having its outer end rigidly connected to the outer end of the tube, a pilot burner in the form of a tube extending from the valve body and having flame jet openings adjacent to one side of the thermally-responsive tube, a gas port leading from the valve body to the pilot burner tube, a valve for said port, a valve stem projecting from the rear side of the body and extending forwardly to a position adjacent to the inner end of said trip rod, a lost-motion connection between the valve stem and the main valve, for holding the valve open against its spring pressure when the stem is in its retracted position, and for releasing the valve for closing movement, when the valve stem is moved to its projected positions, a connection between the stem and the second-named valve, to effect opening and closing of the said port through longitudinal movements of the valve stem, and means on the trip rod, for holding the stem retracted and the main valve open when the thermally-responsive tube is heated on one side by flames from said jet openings and for releasing the valve stem for a projecting movement under pressure of the spring that closes the main valve, when the jet flames become extinguished, the said movement of the stem serving to close the valve of said port.

9. Control apparatus, comprising a valve body, a main valve therein for controlling flow of gas therethrough to a main burner, a spring yieldably holding the valve in its closed position, a thermally-responsive tube carried by said body and projecting forwardly therefrom, a trip rod in the tube and having its outer end rigidly connected to the outer end of the tube, a pilot burner in the form of a tube extending from the valve body and having flame jet openings adjacent to

one side of the thermally-responsive tube, a valve for said port, a valve stem projecting from the rear side of the body and extending forwardly to a position adjacent to the inner end of said trip rod, a lost-motion connection between the valve stem and the main valve, for holding the valve open against its spring pressure when the stem is in its retracted position, and for releasing the valve for closing movement, when the valve stem is moved to its projected positions, a connection between the stem and the second-named valve, to effect opening and closing of the said port through longitudinal movements of the valve stem, means on the trip rod, for holding the stem retracted and the main valve open when the thermally-responsive tube is heated on one side by flames from said jet openings and for releasing the valve stem for a projecting movement under pressure of the spring that closes the main valve, when the jet flames become extinguished, the said movement of the stem serving to close the valve of said port, and a lost-motion latch connection between the stem and the trip rod, for positively limiting retractive movement of the stem to a distance that only the valve for said port is opened, the latch being automatically released when the thermally-responsive tube becomes heated on one side by said flames, and the stem being then further movable under manually-applied retractive force, to a point at which the main gas valve is opened and the forward end of the stem becomes again engaged by the trip rod and thereby held in its retracted position.

10. Control apparatus comprising a valve for controlling flow of gas to a burner, a valve stem for operating the valve, means yieldably urging the stem to a projected position at which the valve is closed, a thermally-responsive device that moves into position to hold the stem in retracted position and the valve open, when the device is

subjected to heat, and which will release the stem when the device becomes cooled, a latch bar and a keeper for releasably holding the stem against retractive movement to a point at which the valve is opened, and a connection between the thermally-responsive device and the keeper, for retaining the latch bar in its holding position, the said device being movable under the application of heat, to move the keeper and release the latch bar.

11. Control apparatus, comprising a valve chamber, a valve therein for controlling flow of gas to a burner, a thermally-responsive tube communicating at one end with the valve chamber and gas tight otherwise, and also having operative connection with said valve, and a burner positioned to heat one side of said tube, the tube being flexed through heating and cooling thereof, to thereby control valve movements, and the tube being of thicker wall section at that area which is engaged by the burner flame and at the diametrically-opposite side thereof than at the areas connecting these two wall sections.

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