

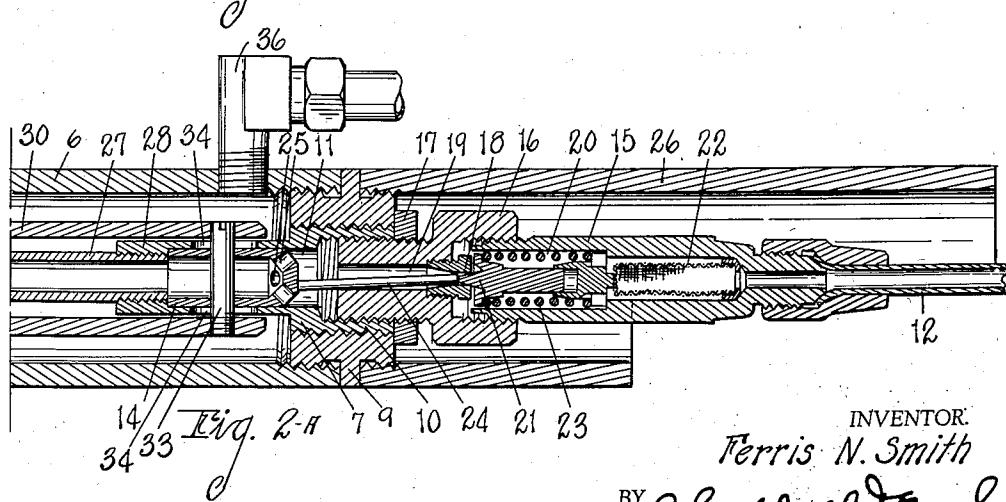
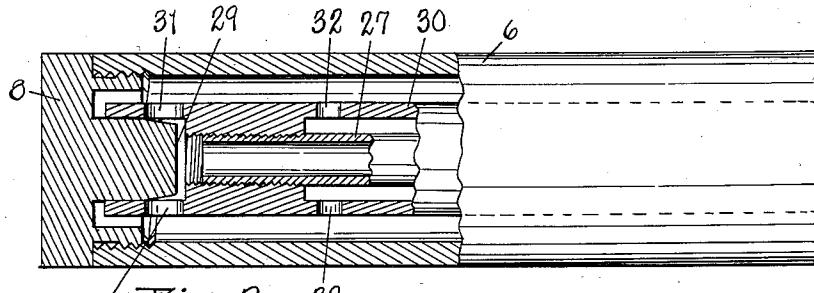
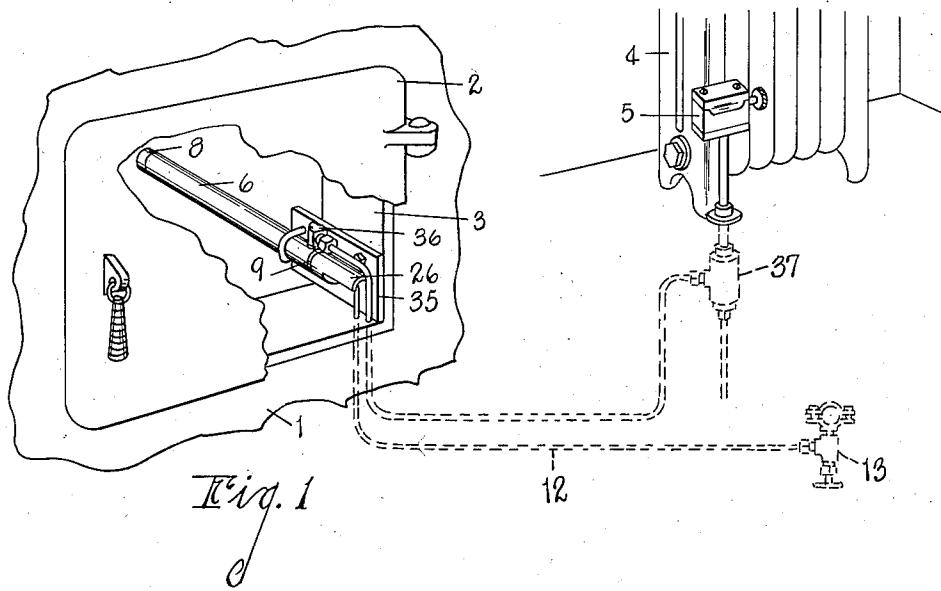
May 7, 1935.

F. N. SMITH

2,000,356

HUMIDIFIER

Filed April 2, 1934



INVENTOR
Ferris N. Smith

BY *Chappell & Carl*

ATTORNEYS

UNITED STATES PATENT OFFICE

2,000,356

HUMIDIFIER

Ferris N. Smith, Grand Rapids, Mich.

Application April 2, 1934, Serial No. 718,690

28 Claims. (Cl. 122—451,1)

The main objects of this invention are:

First, to provide an automatically controlled steam generator which is well adapted for use in connection with a house heating system.

Second, to provide a steam generator of this character which may be quickly and easily installed in a boiler or furnace.

19. Third, to provide an automatically controlled steam generator in which the amount of steam delivered may be accurately regulated.

Fourth, to provide a valve control means for a steam generator in which the valve is opened with a snap action, thereby minimizing scoring of the valve seat and preventing clogging there-

Objects relating to details and economies of my invention will appear from the description to follow. The invention is defined and pointed out in the claims.

157 A structure which is a preferred embodiment of my invention is illustrated in the accompanying drawing, in which:

Fig. 1 is a fragmentary perspective view of portions of a heating system shown mainly in conventional form with a humidifying apparatus embodying my improvements in operative relation thereto.

Fig. 2 is an enlarged view in side elevation of an outer end portion of a commercial embodiment of my invention, portions being broken away and shown in longitudinal section.

Fig. 2A is a view of the inner end portion similar to and a continuation of Fig. 2.

In the accompanying drawing, numeral 1 represents a heating furnace or boiler, 2 the fire or combustion chamber door, and 3 the door frame. 4 represents a radiator and 5 a steam distributing head disposed adjacent the radiator so that the air currents set up by the radiator will distribute the steam or vapor delivered to the humidifier head.

In the embodiment of my generator illustrated, the boiler comprises a tube-like body member 6 and a head member 7, the body member 6 being internally threaded at the outer end to receive the closure plug 8 and internally threaded at its inner end to receive the tubular section 9 into which is threaded the enlarged portion 10 of the head member. The head member is chambered to provide an inlet chamber 11 connected to a suitable source of water supply through the conduit 12, this conduit having a cut-off valve 13. The chamber 11 is in the form of a bore in the head member and constitutes a guide for the cylindrical plunger or slide 14.

The head member is provided with a valve unit 15 having a plug-like end fitting 16 threaded into the enlarged portion 10 of the head member and held in place by the lock nut 17. The fitting 16 has a valve seat 18 threaded in the central bore 19 connecting the inlet chamber 11 and the valve chamber 20.

The valve unit is provided with a screen 22 through which the water must pass before it enters the valve chamber 20. The valve 21 is normally closed by the pressure of the inlet water assisted by the compression spring 23 in the valve chamber.

The cylindrical plunger or slide 14 coacts with the push rod 24 extending through the bore 16 to open the valve 21 when the sleeve is advanced. The end of the plunger coacting with the push

rod 24 is provided with a plurality of ports 25 for the passage of water therethrough. On the tubular section 9, I mount a guard 26 for shielding the valve unit 15 to prevent the same from being damaged as by striking it with a shovel used in throwing fuel into the furnace through the door frame 3 when the device is installed in an exposed position as in Fig. 1.

Within the boiler and disposed concentrically thereof, I mount a tubular thermostatic member 27 threaded within the reduced portion 28 of the head member so that it is supported thereby at its inner end with its outer end spaced from the 30

central stud 29 of the closure plug 8. A coacting tubular thermostatic member or element 30 is threaded upon the outer end of the thermostatic member 27, the outer end of the member 30 being sleeved over the stud 29 as shown whereby it is supported thereby and furnishes an effective heat conducting contact between the wall of the unit and the thermostatic element. The stud 29 is tapered as shown and the outer end of the thermostatic element 30 is provided with outlet ports 31 for the passage of water delivered by the inner thermostatic member 27. The outer thermostatic member 30 is also provided with ports 32 adjacent the outer end of the inner thermostatic member 27.

The inner end of the thermostatic member 30 is keyed or pinned to the plunger 14 by means of the transverse pin 33, the reduced portion 28 of the head member 7 being provided with opposed longitudinal slots 34 therefor. A lost motion connection is thus provided between the thermostatic elements at their inner ends, said elements being connected at their outer ends. The concentric relation of the thermostatic elements at their inner ends is maintained by the reduced portion 28.

28 of the head member 7, the inner end of the thermostatic member 30 being freely movable relative to the reduced portion 28 of the head.

The relation of the valve 21 with the thermostatic element 30 may be adjusted by loosening the lock nut 17 and rotating the fitting 16 of the valve unit.

10 The boiler unit is mounted on the supporting plate 35 which may be bolted to the frame of the door of the furnace so that the boiler is supported in suitable position in the combustion chamber. Water is supplied to the device through the connection 12 and its delivery to the boiler is controlled by the valve.

15 The boiler has a discharge connection 36 preferably at its inner end and connected to the diffuser head as illustrated in Fig. 1, a separator trap 37 being preferably used in this connection.

20 The thermostatic elements are of different coefficients of expansion, the outer element preferably having a relatively high coefficient of expansion and the inner element a relatively low coefficient of expansion. Iron for the inner thermostatic element 27 and brass for the outer thermostatic element 30 nicely satisfy this requirement. Thus, when the thermostatic elements expand to a predetermined degree, the expansion of the outer element cracks the valve admitting water into the valve chamber and thence into 25 the inner thermostatic element. The latter has been expanded to a substantial degree, but relatively less than the outer element and the incoming water acting on the inner element causes it to contract quite rapidly and fully opens the valve 30 with a snap action.

35 The water is discharged from the inner element into the boiler and the outer thermostatic element causing the outer thermostatic element to contract, whereupon the valve is closed by its spring and the pressure on the water behind it. This action is quite rapid and the water is supplied to the boiler in approximately measured amounts so it may be quickly converted to steam and delivered to the distributor head through the connections described. It will be understood that 40 when the fire is low the device does not operate, but that is a desired condition as it is not desirable to discharge steam into a cold room.

45 I have illustrated and described my improvements in an embodiment which I have found very practical. I have not attempted to illustrate or describe other embodiments or adaptations, as it is believed this disclosure will enable those skilled in the art to embody or adapt my improvements 50 as may be desired.

55 Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

60 1. In an automatically controlled steam generator, the combination of a boiler comprising a tube-like body member, a closure plug mounted into the outer end of said body member and having a central inwardly projecting stud, closure means including a head member threaded into the 65 inner end of said body member and having an inlet chamber, the boiler having a discharge adjacent its inner end, a valve unit associated with said head member and having a central bore opening to said inlet chamber and provided with a valve seat, a spring closed valve coacting with 70 said valve seat, a plunger mounted in said inlet chamber for longitudinal movement, a push rod disposed in said bore between said plunger and said valve for opening the latter when the plunger is advanced, a tubular inner thermostatic ele- 75

ment mounted on said head member concentrically of said boiler and opening at its inner end to said inlet chamber and at its outer end to said boiler, an outer thermostatic element mounted on the outer end of said inner thermostatic element and having its outer end sleeved over said stud and its inner end sleeved over said head member, the outer thermostatic element having wall ports in its outer end, and a transverse pin connecting the inner end of said outer thermostatic element to said plunger, the head member having opposed longitudinal slots for the passage of said pin whereby the plunger is advanced by the expansion of said outer thermostatic element and by the contraction of said inner thermostatic element.

2. In an automatically controlled steam generator, the combination of a boiler comprising a body member, a closure plug threaded into the outer end of said body member and having a central inwardly projecting stud, closure means including a head member threaded into the inner end of said body member and having an inlet chamber, the boiler having a discharge adjacent its inner end, a valve unit associated with said head member and having a central bore opening to said inlet chamber and provided with a valve seat, a valve coacting with said valve seat, a plunger mounted in said inlet chamber for longitudinal movement, a push rod disposed in said bore between said plunger and said valve for opening the latter when the plunger is advanced, a tubular inner thermostatic element mounted on said head member and opening at its inner end to said inlet chamber and at its outer end to said boiler, an outer thermostatic element mounted on the outer end of said inner thermostatic element and having its outer end sleeved over said stud and its inner end sleeved over said head member, the outer thermostatic element having wall ports in its outer end, and a transverse pin connecting the inner end of said outer thermostatic element to said plunger, the head member having opposed longitudinal slots for the passage of said pin whereby the plunger is advanced by the expansion of said outer thermostatic element and by the contraction of said inner thermostatic element.

3. In an automatically controlled steam generator, the combination of a boiler comprising a tube-like body member, a closure plug mounted in the outer end of said body member and having an inwardly projecting stud, closure means including a head member mounted in the inner end of said body member and having an inlet chamber, the boiler having a discharge adjacent its inner end, a valve unit associated with said head member and having a bore opening to said inlet chamber and provided with a valve seat, a valve coacting with said valve seat, a plunger mounted in said inlet chamber for longitudinal movement, means disposed in said bore between said plunger and said valve for opening the latter when the plunger is advanced, a tubular inner thermostatic element mounted on said head member and opening at its inner end to said inlet chamber and at its outer end to said boiler, an outer thermostatic element mounted on the outer end of said inner thermostatic element and having its outer end sleeved over said stud and its inner end sleeved over said head member, the outer thermostatic element having wall ports adjacent its outer end, and means connecting the inner end of said outer thermostatic element to said plunger, the head member having slots for the passage of said con-

necting means whereby the plunger is advanced by the expansion of said outer thermostatic element and by the contraction of said inner thermostatic element.

5. In an automatically controlled steam generator, the combination of a boiler comprising a tube-like body member closed at its outer end, closure means including a head member mounted in the inner end of said body member and having an inlet chamber, the boiler having a discharge adjacent its inner end, a valve unit associated with said head member and having a central bore opening to said inlet chamber and provided with a valve seat, a spring closed valve 10 coating with said valve seat, a plunger mounted in said inlet chamber for longitudinal movement, a push rod disposed through said bore between said plunger and said valve for opening the latter when the plunger is advanced, 15 a tubular inner thermostatic element mounted on said head member concentrically of said boiler and opening at its inner end to said inlet chamber and at its outer end to said boiler, an outer thermostatic element mounted on the 20 outer end of said inner thermostatic element and having its inner end sleeved over said head member, the outer thermostatic element having wall ports adjacent its outer end, and a transverse pin connecting the inner end of said outer thermostatic element to said plunger, the head member 25 having opposed longitudinal slots for the passage of said pin whereby the plunger is advanced by the expansion of said outer thermostatic element and by the contraction of said inner thermostatic element.

30 5. In an automatically controlled steam generator, the combination of a boiler comprising a tube-like body member, a closure plug threaded into the outer end of said body member and having a central inwardly projecting stud, means including a head member threaded into the inner end of said body member and having an inwardly projecting central portion of reduced diameter, a tubular inner thermostatic element 35 mounted on the reduced portion of said head member concentrically of said boiler and opening at its outer end in spaced relation to said stud, a tubular outer thermostatic element sleeved at its ends over said stud and the reduced portion of said head member and having a threaded connection with the outer end of said inner thermostatic element, the thermostatic elements being disposed concentrically and the outer element having wall ports adjacent both ends of its threaded connection with the outer end of said inner thermostatic element, a plunger mounted for longitudinal movement in said head member and keyed to the inner end of said outer thermostatic element for actuation thereby, 40 a valve unit having an end fitting threaded into said head member for longitudinal adjustment and having a central longitudinal bore provided with a valve seat at one end, a spring closed valve coating with said seat, and a push rod disposed between said plunger and said valve in said bore for opening the valve when the plunger is advanced.

45 6. In an automatically controlled steam generator, the combination of a boiler comprising a tube-like body member, a closure plug mounted in the outer end of said body member and having an inwardly projecting tapered stud, means including a head member mounted in the inner end of said body member and having an inwardly projecting portion of reduced diameter, a tubular inner thermostatic element having a relatively low coefficient of linear expansion mounted on the reduced portion of said head member and opening at its outer end in spaced relation to said stud, a tubular outer thermostatic element having a relatively high coefficient of linear expansion sleeved at its ends over said stud and the reduced portion of said head member and having a connection with the outer end of said inner thermostatic element, the outer element having wall ports adjacent both ends of its connection with the outer end of said inner thermostatic element, a plunger mounted for longitudinal movement in said head member and keyed to the inner end of said outer thermostatic element for actuation thereby, a valve unit having an end fitting mounted in said head member for longitudinal adjustment and having a longitudinal bore provided with a valve seat at one end, a 50

70 7. In an automatically controlled steam generator, the combination of a boiler comprising a tube-like body member, a closure plug threaded into the outer end of said body member and having a central inwardly projecting stud, means including a head member threaded into the inner end of said body member and having an inwardly projecting central portion of reduced diameter, a tubular inner thermostatic element mounted on the reduced portion of said head member concentrically of said boiler and opening at its outer end to said inlet chamber, a tubular outer thermostatic element sleeved at its ends over said stud and the reduced portion of said head member and having a connection with the outer end of said inner thermostatic element, the outer element having wall ports adjacent both ends of its connection with the outer end of said inner thermostatic element, a plunger mounted for longitudinal movement in said head member and keyed to the inner end of said outer thermostatic element for actuation thereby, a valve unit having an end fitting threaded into said head member for longitudinal adjustment and having a longitudinal bore provided with a valve seat at one end, a 55

75 8. In an automatically controlled steam generator, the combination of a boiler comprising a tube-like body member, a closure plug mounted in the outer end of said body member and having an inwardly projecting central portion of reduced diameter, a tubular inner thermostatic element having a relatively low coefficient of linear expansion mounted on the reduced portion of said head member and opening at its outer end in spaced relation to said stud, a tubular outer thermostatic element having a relatively high coefficient of linear expansion sleeved at its ends over said stud and the reduced portion of said head member and having a connection with the outer end of said inner thermostatic element, the outer element having wall ports adjacent both ends of its connection with the outer end of said inner thermostatic element, a plunger mounted for longitudinal movement in said head member and keyed to the inner end of said outer thermostatic element for actuation thereby, a valve unit having an end fitting mounted in said head member for longitudinal adjustment and having a longitudinal bore provided with a valve seat at one end, a 60

70

75

spring closed valve coacting with said seat, a push rod disposed between said plunger and said valve in said bore for opening the valve when the plunger is advanced, and a cylindrical shield or guard 5 mounted on the inner end of said body member for protecting said valve unit.

9. In an automatically controlled steam generator, the combination of a boiler comprising a tube-like body member, a closure plug mounted 10 in the outer end of said body member and having an inwardly projecting tapered stud, means including a head member mounted in the inner end of said body member and having an inwardly projecting portion of reduced diameter, a tubular 15 inner thermostatic element having a relatively low coefficient of linear expansion mounted on the reduced portion of said head member and opening at its outer end in spaced relation to said stud, a tubular outer thermostatic element 20 having a relatively high coefficient of linear expansion sleeved at its ends over said stud and the reduced portion of said head member and having a connection with the outer end of said inner thermostatic element, the outer element 25 having wall ports adjacent both ends of its connection with the outer end of said inner thermostatic element, a plunger mounted for longitudinal movement in said head member and keyed to the inner end of said outer thermostatic element 30 for actuation thereby, a valve unit having an end fitting mounted in said head member for longitudinal adjustment and having a longitudinal bore provided with a valve seat at one end, a spring closed valve coacting with said seat, and 35 a push rod disposed between said plunger and said valve in said bore for opening the valve when the plunger is advanced.

10. In an automatically controlled steam generator, the combination of a boiler comprising a tube-like body member closed at its outer end, 40 means including a head member mounted in the inner end of said body member and having an inwardly projecting portion of reduced diameter, a tubular inner thermostatic element mounted on the reduced portion of said head member, a tubular outer thermostatic element sleeved at its inner end over said reduced portion of said head member and having a connection with the outer end of said inner thermostatic element, the outer 45 element having wall ports adjacent both ends of its connection with the outer end of said inner thermostatic element, a plunger mounted for longitudinal movement in said head member and connected to the inner end of said outer thermostatic element for actuation thereby, a valve unit 50 having an end fitting mounted in said head member for longitudinal adjustment and having a longitudinal bore provided with a valve seat at one end, a spring closed valve coacting with said seat, and a push rod disposed between said plunger and said valve in said bore for opening the valve when the plunger is advanced, and a cylindrical shield or guard 55 mounted on the inner end of said body member for protecting said valve unit.

11. In an automatically controlled steam generator, the combination of a boiler comprising a tube-like body member closer at its outer end, 60 means including a head member mounted in the inner end of said body member and having an inwardly projecting portion of reduced diameter, a tubular inner thermostatic element mounted on the reduced portion of said head member, a tubular outer thermostatic element sleeved at its inner end over said reduced portion of said head 65 member and having a connection with the outer 70 member and having a connection with the outer 75

end of said inner thermostatic element, the outer element having wall ports adjacent both ends of its connection with the outer end of said inner thermostatic element, a plunger mounted for longitudinal movement in said head member and connected to the inner end of said outer thermostatic element for actuation thereby, a valve unit having an end fitting mounted in said head member for longitudinal adjustment and having a longitudinal bore provided with a valve seat at one end, a spring closed valve coacting with said seat, and a push rod disposed between said plunger and said valve in said bore for opening the valve when the plunger is advanced.

12. In a structure of the class described, the combination with an elongated cylindrical boiler provided with a boiler chamber and an inlet chamber, of a valve chamber communicating with said inlet chamber through a port having a valve seat, a valve member slidable within said valve chamber and having a conical valve coacting with said seat, an inner tubular thermostatic element having a connection with the inner end of said boiler chamber and opening at its outer end to said boiler, an outer thermostatic element disposed concentrically relative to the inner thermostatic element and to the walls of the boiler and connected to the outer end of said inner thermostatic element, said outer thermostatic element having a relatively high coefficient of expansion compared to that of said inner thermostatic element, a plunger in said inlet chamber connected to the inner end of said outer thermostatic element, and a push rod extending through said port between said plunger and said valve.

13. In a structure of the class described, the combination with an elongated boiler provided with a boiler chamber and an inlet chamber, of a valve chamber communicating with said inlet chamber through a port having a valve seat, a valve member slidable within said valve chamber and having a valve coacting with said seat, an inner tubular thermostatic element having a connection with the inner end of said boiler chamber and opening at its outer end to said boiler, an outer thermostatic element connected to the outer end of said inner thermostatic element, said outer thermostatic element having a relatively high coefficient of expansion compared to that of said inner thermostatic element, and means in said inlet chamber connected to the inner end of said outer thermostatic element and extending through said port for coaction with said valve whereby the valve is cracked upon a predetermined expansion of said thermostatic elements and the inner element is subjected to the incoming water whereby it contracts in advance of the contraction of the outer element to fully open the valve with a snap action.

14. In an automatically controlled steam generator, the combination of an elongated cylindrical boiler, an inlet valve chamber provided with an inlet port having a valve seat, a valve member slidable within said valve chamber and having a conical valve coacting with said seat, a thermostatic element connected to the valve by means including a push rod, a coacting tubular thermostatic element mounted at one end and having a connection to the outer end of said thermostatic element, the thermostatic element having a relatively low coefficient of expansion, the valve being cracked upon a predetermined expansion of said thermostatic elements and the tubular element being subjected to the incoming water and being contracted in advance of the co-

acting element to fully open the valve with a snap action, and means acting to normally seat said valve.

15. In an automatically controlled steam generator, the combination of an elongated boiler, an inlet valve chamber provided with an inlet port having a valve seat, a valve member slidable within said valve chamber and having a valve coacting with said seat, a thermostatic element connected to the valve by means including a push rod, a coacting thermostatic element mounted at one end and having a connection to the outer end of said first named thermostatic element, the second named thermostatic element having a relatively low coefficient of expansion compared to said first named thermostatic element, the valve being cracked upon a predetermined expansion of said thermostatic elements and the second named element being subjected to the incoming water and being contracted in advance of the first named element to fully open the valve with a snap action, and means acting to normally seat said valve.

16. In a structure of the class described, the combination of a boiler, an inlet valve, a thermostatic element adjustably associated with said inlet valve, and a second thermostatic element mounted at the inner end thereof with respect to said inlet valve, said thermostatic elements having a connection at their outer ends, the second thermostatic element having a relatively low coefficient of expansion and being subject to the incoming water whereby it contracts in advance of the contraction of the coacting thermostatic element.

17. In a structure of the class described, the combination of a boiler, an inlet valve, a thermostatic element associated with said inlet valve, and a second thermostatic element mounted at the inner end thereof with respect to said inlet valve, said thermostatic elements having a connection at their outer ends, the second thermostatic element having a relatively low coefficient of expansion and being subject to the incoming water whereby it contracts in advance of the contraction of the coacting thermostatic element.

18. In a structure of the class described, the combination of a boiler, an inlet valve, a thermostatic element adjustably associated with said inlet valve, and a second thermostatic element mounted at the inner end thereof with respect to said inlet valve, said thermostatic elements having a connection at their outer ends, the thermostatic elements having different coefficients of expansion, the element having the lowest coefficient of expansion being subject to the incoming water whereby it contracts in advance of the contraction of the coacting thermostatic element.

19. In a structure of the class described, the combination of a boiler, an inlet valve, a thermostatic element associated with said inlet valve, and a second thermostatic element mounted at the inner end thereof with respect to said inlet valve, said thermostatic elements having a connection at their outer ends, the thermostatic elements having different coefficients of expansion, the element having the lowest coefficient of expansion being subject to the incoming water whereby it contracts in advance of the contraction of the coacting thermostatic element.

20. In an automatically controlled steam generator, the combination of a tube-like boiler closed at its outer end and provided with an inwardly projecting central stud at its outer end and an outlet adjacent its inner end, a tubular inlet member projecting centrally into the boiler at its inner end, a spring seated inlet valve delivering to said inlet member, a hollow plunger slidable within said inlet member and having inlet openings at its outer end, a push rod operatively associated with said plunger and inlet valve, a tubular inner thermostatic element secured to the inner end of said tubular inlet member, and an outer tubular thermostatic element connected to the outer end of said inner thermostatic element and having sliding supporting engagement with said stud at the outer end of said boiler and telescoping engagement with said inlet member and connected to said plunger whereby the plunger is actuated through the expansion and contraction of said thermostatic elements.

21. In an automatically controlled steam generator, the combination of a boiler, a tubular inlet member projecting centrally into the boiler at its inner end, a spring seated inlet valve delivering to said inlet member, a hollow plunger slidable within said inlet member and having inlet openings at its outer end, a push rod operatively associated with said plunger and inlet valve, a tubular inner thermostatic element secured to the inner end of said tubular inlet member, and an outer tubular thermostatic element connected to the outer end of said inner thermostatic element and having telescoping engagement with said inlet member and connected to said plunger whereby the plunger is actuated through the expansion and contraction of said thermostatic elements.

22. In an automatically controlled steam generator, the combination of a tube-like boiler provided with an inwardly projecting central stud at its outer end, a tubular member projecting centrally into the boiler at its inner end, an inlet valve delivering to said inlet member, a plunger having a lost motion connection to said valve, an inner tubular thermostatic element mounted on the inner end of said tubular inlet member, and an outer tubular thermostatic element secured upon the outer end of said inner thermostatic element and having sliding supporting engagement with said stud at the outer end of said boiler and telescoping engagement with said inlet member and connected to said plunger whereby the plunger is actuated through the expansion and contraction of said thermostatic elements.

23. In an automatically controlled steam generator, the combination of a boiler, a tubular member projecting centrally into the boiler at its inner end, an inlet valve delivering to said inlet member, a plunger having a lost motion connection to said valve, an inner tubular thermostatic element mounted on the inner end of said tubular inlet member, and an outer tubular thermostatic element secured upon the outer end of said inner thermostatic element and having telescoping engagement with said inlet member and connected to said plunger whereby the plunger is actuated through the expansion and contraction of said thermostatic elements.

24. In an automatically controlled steam generator, the combination of a tube-like boiler having an inlet at one end and an inwardly projecting central stud at its other end, a tubular inner thermostatic element disposed centrally of said tubular boiler and fixedly mounted at the inlet end thereof to receive fluid from said inlet, an outer thermostatic element disposed concentrically of said inner thermostatic element and se-

cured to the outer end thereof, the inner end of said outer thermostatic element being slidably supported, the outer thermostatic element being in telescoping engagement with said stud, a 5 spring seated valve, and an operating connection for said outer thermostatic element to said valve.

25. In an automatically controlled steam generator, the combination of a tube-like boiler having an inlet at one end, a tubular inner thermostatic element disposed centrally of said tubular boiler and fixedly mounted at the inlet end thereof to receive fluid from said inlet, an outer thermostatic element disposed concentrically of said inner thermostatic element and secured to the 10 outer end thereof, the inner end of said outer thermostatic element being slidably supported, a spring seated valve, and an operating connection for said outer thermostatic element of said valve.

26. In an automatically controlled steam generator, the combination of a boiler having a 15 spring seated inlet valve, a tubular inner thermostatic element fixedly mounted at one end to receive fluid from said inlet valve, an outer thermostatic element disposed concentrically of said inner thermostatic element and secured to the outer end thereof, the inner end of said outer thermostatic element being slidably supported, and an operating connection for said outer thermostatic element to said valve including a push 20 rod supported in operative relation to the valve

and thermostatic element but being otherwise independent thereof.

27. In an automatically controlled steam generator, the combination with a boiler, a tubular inner thermostatic element disposed within said boiler and fixedly mounted at one end thereof, a water supply connection delivering to said thermostatic element and including an inlet valve, an outer thermostatic element connected to the outer end of said inner thermostatic element and having sliding heat-transferring supporting contact with an element of said boiler, the inner end of said outer thermostatic element being supported to permit longitudinal expansion of the element, and an operating connection for said outer thermostatic element to said valve. 15

28. In an automatically controlled steam generator, the combination with a boiler, a tubular inner thermostatic element disposed within said boiler and fixedly mounted at one end thereof, a 20 water supply connection delivering to said thermostatic element and including an inlet valve, an outer thermostatic element connected to the outer end of said inner thermostatic element, the inner end of said outer thermostatic element being supported to permit longitudinal expansion of the element, and an operating connection for said outer thermostatic element to said valve. 25

FERRIS N. SMITH. 30