Dec. 11, 1928. 1,695,241

L. W. EGGLESTON

AUTOMATIC DRAFT REGULATOR FOR BOILERS

Filed Feb. 27, 1923

Fig. 1.

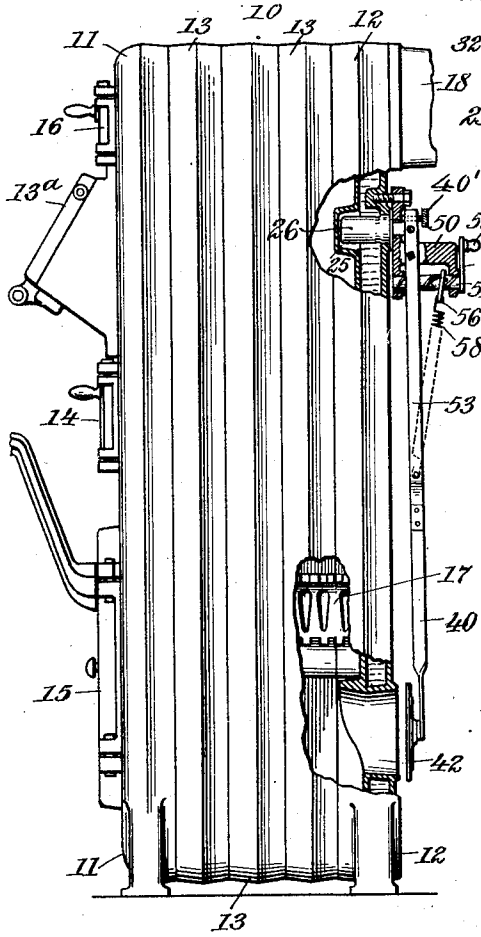


Fig. 2.

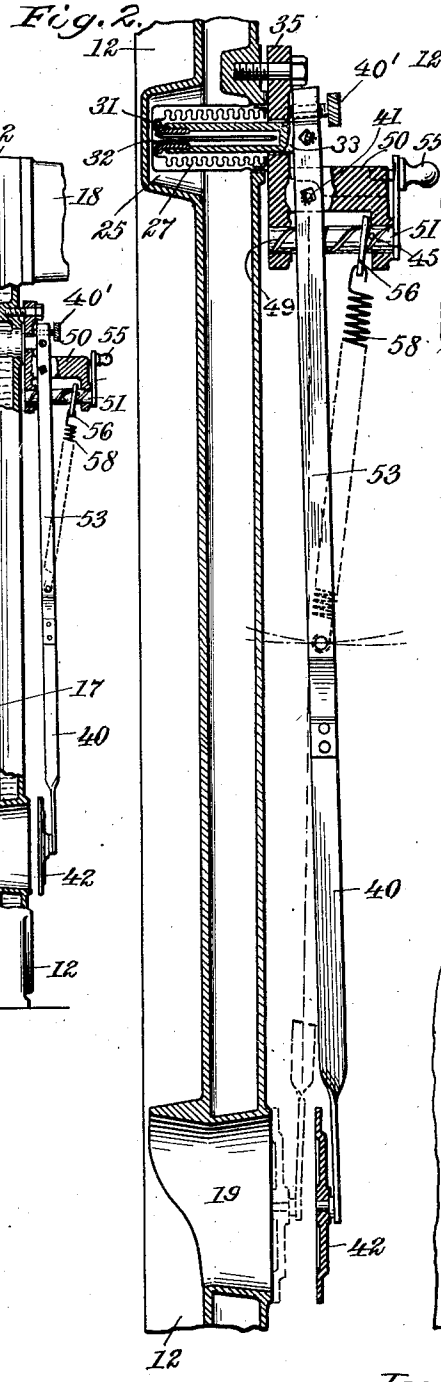


Fig. 3.

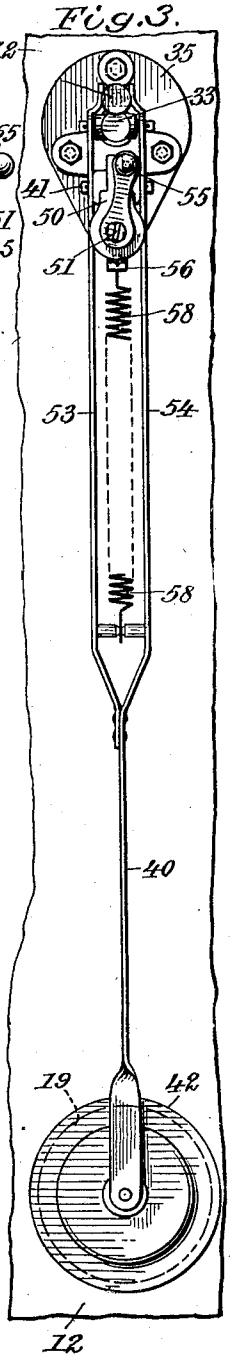
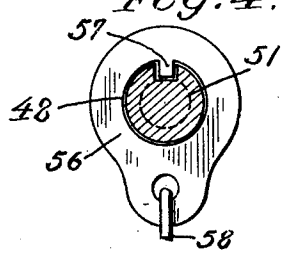


Fig. 4.



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UNITED STATES PATENT OFFICE.

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AUTOMATIC DRAFT REGULATOR FOR BOILERS.

Application filed February 27, 1923. Serial No. 621,683.

My invention relates to improvements in heating apparatus, and has for its principal object the provision of a simple, compact and efficient device for controlling the rate of fuel consumption in a boiler, furnace or analogous apparatus.

Further, this invention has for its object to provide a draft regulator for a heating apparatus which is capable of controlling the temperature thereof.

Further, this invention has for its object the provision of means responsive to conditions within the heating apparatus for controlling the temperature-regulating device.

Further, this invention has for its object the provision of temperature-controlling means capable of adjustment to predetermine the temperature at which the heating apparatus is to be maintained.

Further, this invention has for its object the provision of hand-operated means for setting the mechanism whereby the temperature of the heat generator is predetermined.

Other objects and advantages will in part be obvious and in part be pointed out hereinafter.

To the attainment of the aforesaid objects and ends my invention consists in the novel details of construction, and in the combination, connection and arrangement of parts hereinafter more fully described and then pointed out in the claims.

In the accompanying drawings forming part of this specification—

Figure 1 is a side view, partly broken away and sectioned, showing a boiler provided with a regulator embodying the principles of my invention;

Fig. 2 is a central vertical side sectional view through the draft regulator;

Fig. 3 is a rear view of the regulator, and

Fig. 4 is an enlarged detail transverse section of the corresponding parts shown in side view at Fig. 2.

In said drawings there is shown a combined boiler and heater 10 comprising a hollow front section 11, a hollow back section 12, and a plurality of substantially loop-shaped intermediate sections 13. The front section 11 is provided with the usual fuel opening having a door 13ª, a slicing opening having a door 14, an ash-pit opening having a door 15, and adjacent to its top with a flue opening provided with a door 16.

Within the boiler, between the front and back sections 11 and 12, are arranged a plurality of grate bars 17 positioned side by side and longitudinally of the boiler. At the upper rear end the boiler is provided with a smoke outlet 18. In the back section 12, adjacent the bottom of the boiler, is provided a cold air inlet 19 which communicates with the interior of the boiler below the grate 17.

Within the back section 12, near the upper end thereof there is formed a cavity 25 in which is positioned a thermostatic element comprising an outer casing 26 and an inner metallic bellows 27, the space between casing 26 and bellows 27 being filled preferably with alcohol, ether or other suitable volatile or expansible fluid. The outer end of said bellows is joined to the casing 26 to seal the space between them. At its inner end the bellows abuts against the casing 26 and is provided with a head 31 having a tube 32 extending therein and closed at its outer end. The inner end of a plunger 33 engages the head 31 and extends through the back wall and through a bracket 35 fixed to the rear of the boiler and has pivotally connected to the outer end thereof one end of a lever 40. Said lever is pivoted near said end upon a knife edge pivot 41 to form a short arm and a long arm. The latter carries at the end thereof a damper plate 42 cooperating with the cold air inlet 19.

As long as the bellows is in its retracted position, the upper end of the lever 40 will be held inwardly and the lower end outwardly to maintain the air inlet 19 open and permit of the increased supply of air which results in an increase of temperature. When the temperature rises sufficiently to contract the bellows, the head 31, plunger 33, and the upper end of lever 40 move outwardly while the lower end of the lever moves inwardly to cause the plate 42 to seal the air inlet opening 19 until the heat of the fire is reduced. The long arm of the lever 40 greatly magnifies the movement of the bellows. The upper or short end of the lever 40 is provided with screw 40′ which extends through the same and has its inner end in contact with the bracket 35, and serves as an adjustable stop to limit the outward movement of the lower end of said lever 40 to which is secured a plate or closure 42. The said screw 40′ also serves to hold the plate or closure 42 rigidly in position to seal the inlet 19, and wholly prevent the actuation of said closure 42, either manually by means of the handle 55

and the associated parts, or automatically by the thermostatic element. To so render the closure 42 inoperative it merely becomes necessary to turn the screw 40′ in a clockwise direction whereby the upper end of the lever 40 will be moved outwardly and the lower end thereof with the plate or closure 42 moved inwardly and held firmly against the rear wall of the back section 12 over the inlet 19 therein.

In order to control the damper plate so that it will open and close at any desired predetermined temperature there is provided, in an extension 50 of the bracket 35, a shaft 51 having a spiral groove 49 therein. The lever 40 may be bifurcated for the greater part of its length so that the adjusting mechanism may be positioned between the arms 53 and 54 thereof. A handle 55 is fixed to the outer end of the shaft upon which works a plate 56 having an opening 48 to receive the shaft 51, and having a depending finger 57 operating in the spiral groove 49. The shaft is held against lateral movement by said handle and a pin 45 contacting with opposite sides of the bracket. A spring 58 is attached at one end in a perforation in the plate 56 and at the other end to a cross-bar connecting arms 53 and 54. It will be obvious that by turning the handle 55 in one direction or the other, the plate 56 will be caused to travel inwardly or outwardly to decrease or increase, respectively, the force which tends to hold the damper plate 42 away from the inlet 19. Thus, e. g., it may be found that with the plate 56 at the extreme right of the screw, the bellows will not develop sufficient pressure to overcome the tension of the spring 58 until a temperature of 220° F. has been reached. The damper plate will remain all the way open until about 210° F. when the bellows commences to overcome the tension of the spring and gradually moves the damper plate toward the opening 19 until the temperature of 220° F. is attained when the air inlet will be completely closed. When the temperature is correspondingly reduced the damper plate will move away from inlet 19. Any other temperature may be similarly predetermined by operating the plate 56 along the shaft 51 to the desired position. If desired a scale may be provided on bracket 35 to cooperate with the handle 55, which thus acts as an indicator.

If the member 56 is shifted towards the left to the opposite side of lever 40 the spring 58 will then act to operate the closure 42 to close the inlet 19 independently of the automatic control thereof, providing manual means for controlling the same.

The arrangement of the spring 58 of the regulator with reference to the thermosensitive or pressure sensitive device 27 and the member 51 and plate 56 working thereon is such that the apparatus will be caused to operate to open and close the damper at approximately the same differences in temperature at all points of adjustment.

While the above description contemplates control of the draft in accordance with the temperature developed within the boiler, it will be apparent that said control may be made dependent upon the pressure in the boiler by merely removing the casing 26 and exposing the bellows 27 directly to said pressure.

It is to be noted that all the openings in the front of the heating apparatus are closed by doors which are ground to fit tightly against or over said openings in order to prevent any admission of air to the interior of the apparatus, and that the air necessary to support combusion is admitted to the heating apparatus wholly through the air inlet 19, which is automatically controlled.

The above description illustrates the principles embodied in my invention, but it will be understood that various changes and modifications may be made within the scope of the invention as defined by the annexed claims.

Having thus described my said invention what I claim and desire to secure by Letters Patent is:

1. The combination of a boiler having a main air supply inlet, with a closure for said inlet, means responsive to conditions within the boiler for actuating said closure to control the passage of air through said inlet, means for normally preventing actuation of said closure until a predetermined condition is reached, and means for shifting said second named means to reverse the action thereof to permit of the control of said closure independently of the automatic control thereof, substantially as specified.

2. The combination of a boiler having a main air supply inlet, with a closure for said inlet, means responsive to conditions within the boiler for actuating said closure to control the passage of air through said inlet, means for normally preventing actuation of said closure until a predetermined condition is reached, and means for shifting said second named means whereby to actuate said closure at any predetermined condition; said last named means being operable to reverse the action of said second named means to permit of the control of said closure independently of the automatic control thereof, substantially as specified.

3. The combination of a boiler having a main air supply inlet, with a closure for said inlet, means responsive to conditions within the boiler for actuating said closure to control the passage of air through said inlet, resilient means for normally preventing actuation of said closure until a predetermined condition is reached, and means for shifting said resilient means to reverse the

action thereof to permit of the control of said closure independently of the automatic control thereof, substantially as specified.

4. The combination of a boiler having a main air supply inlet, with a closure for said inlet, a pivoted lever to which said closure is attached at one end, means responsive to conditions within the boiler and connected to the other end of said lever for actuating said closure to control the passage of air through said inlet, a resilient member connected at one end to said lever towards said closure, and connected at its opposite end to a part adjacent to and below the pivot of said lever, and means for shifting the last named end of said member from one side to the opposite side of said lever, substantially as specified.

5. The combination of a boiler having a main air supply inlet, with a lever suspended from a point adjacent to its upper end, a closure for said inlet connected to the free end of said lever, means responsive to temperature within the boiler and associated with said lever for actuating said closure to control the passage of air through said inlet, a resilient member connected at one end to said lever and extending upwardly at an acute angle thereto and connected at its opposite end at a point adjacent to the pivot of said lever, and manually operable means for varying the position of said resilient member in accordance with a predetermined temperature at which said closure is to be actuated by said responsive means, substantially as specified.

6. The combination of a boiler having a main air supply inlet in the wall thereof, with a closure for said inlet, actuating means responsive to conditions within the boiler mounted on said wall in spaced relation to and above said inlet, a lever pivotally mounted on said wall at a point between said inlet and said actuating means, and extending downwardly along said wall from said actuating means towards said inlet; said lever being connected at one end to said closure, and being operatively associated at the opposite side of said pivot with said actuating means, and a resilient member connected at one end to said lever at a point towards said closure, and extending along said lever towards the pivoted end thereof at an acute angle therewith, and connected at its opposite end to an adjacent part, substantially as specified.

7. The combination of a boiler having a main air supply inlet, with a closure for said inlet, a lever to which said closure is connected at one end, means responsive to conditions within the boiler and connected to the other end of said lever for actuating said closure to control the passage of air through said inlet, a resilient member connected at one end to said lever, and extending along the same at an acute angle therewith, and means at the opposite end of said member for moving said opposite end transversely of said lever to vary the angle between said member and said lever, substantially as specified.

8. The combination of a boiler having a main air supply inlet, a lever suspended from a point adjacent to its upper end, a closure for said inlet secured to the free end of said lever, means responsive to temperature within the boiler and connected to said lever adjacent to its upper end for actuating said closure to control the passage of air through said inlet, a resilient member connected at one end to said lever adjacent to said closure and extending towards the pivotal end of said lever and at an acute angle thereto, and means at the other end of said resilient member for adjusting the upper end of said resilient member towards and from said lever to vary the angle thereof with respect to said lever, and adjusting means for said lever to vary the normal position of said lever and closure carried thereby in accordance with the predetermined temperature at which said closure shall be actuated, substantially as specified.

9. The combination of a boiler having a main air supply inlet, with a closure for said inlet, a lever to which said closure is attached at one end, means responsive to temperature within the boiler and connected to the other end of said lever for actuating said closure to control the passage of air through said inlet, a resilient member connected at one end to said lever for preventing actuation of said closure until a predetermined temperature is reached, and means for varying the angular position of said member relative to said lever in accordance with the temperature at which said closure may be actuated, substantially as specified.

10. The combination of a boiler having a main air supply inlet, with a closure for said inlet, a lever to which said closure is attached at one end, means responsive to temperature within the boiler and connected to the other end of said lever for actuating said closure to control the passage of air through said inlet, a resilient member connected at one end to said lever for preventing actuation of said closure until a predetermined temperature is reached, and manually operable means at the other end of said member for varying the angular position of said member relative to said lever in accordance with the temperature at which said clo sure may be actuated, substantially as spe cified.

11. The combination of a boiler having a main air supply inlet, with a closure for said inlet, a lever to which said closure is attached at one end, means responsive to temperature within the boiler and connected to the other end of said lever for actuating said

closure to control the passage of air through said inlet, a resilient member connected at one end to said lever for preventing actuation of said closure until a predetermined temperature is reached, and means for varying the position of the other end of said member relative to said lever in accordance with the temperature at which said closure may be actuated, said last-named means comprising a screw, a member operable axially of said screw, and to which the other end of said resilient member is attached, substantially as specified.

12. The combination of a boiler having a main air supply inlet, with a closure for said inlet, means responsive to temperature within the boiler for actuating said closure to control the passage of air through said inlet, resilient means for preventing actuation of said closure until a predetermined temperature is reached, means for angularly shifting the position of said resilient means in accordance with the temperature at which said closure shall become operative to seal said inlet, and means cooperating with the means for adjusting said resilient means for holding said closure to adjusted position, substantially as specified.

13. The combination of a boiler having a main air supply inlet, with a closure for said inlet, means responsive to temperature within the boiler for actuating said closure to control the passage of air through said inlet, and adjustable means operatively associated with said closure for varying the position of such closure in accordance with any predetermined temperature at which said closure is actuated by said responsive means; said adjustable means being operable to control said closure independently of the automatic control thereof, substantially as specified.

14. The combination of a boiler having a main air supply inlet, with a closure for said inlet, a lever to one end of which said closure is attached, means responsive to temperature within the boiler and associated with the other end of said lever for actuating said closure to control the passage of air through said inlet, adjustable means for maintaining said closure in predetermined position, and means for manually operating said closure comprising a screw, and means co-acting with said screw and associated with said lever for actuating said closure independently of the automatic control thereof, for controlling said closure independently of the automatic control thereof, substantially as specified.

15. The combination of a boiler having a main air supply inlet, with a lever suspended substantially from its upper end, a closure for said inlet carried by the free end of said lever, means responsive to conditions within the boiler and connected to the other end of said lever for actuating said closure to control the passage of air therethrough, a resilient member for maintaining said closure in open position, a screw, and means co-acting with said screw for varying the angular relation of said resilient member and said lever to vary the temperature at which said closure may be actuated, substantially as specified.

Signed at the city of New York, in the county and State of New York, this 19th day of February, one thousand nine hundred and twenty-three.

LEWIS W. EGGLESTON.