W. J. TURNER.

AUTOMATIC DAMPER REGULATOR.

APPLICATION FILED FEB. 7, 1910.

986,658.

Patented Mar. 14, 1911.

2 SHEETS—SHEET 1.

Fig. 1.

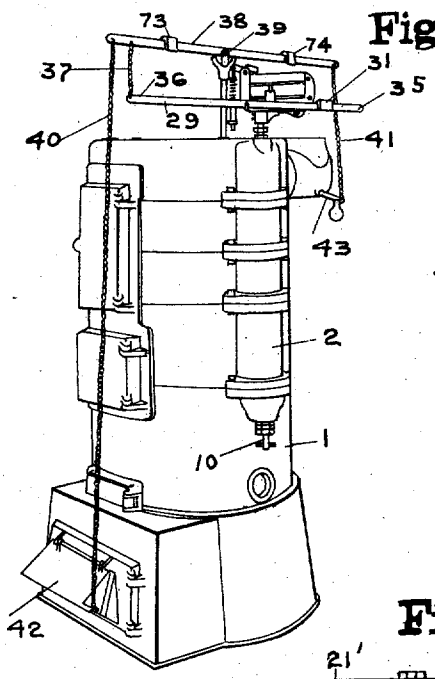


Fig. 3.

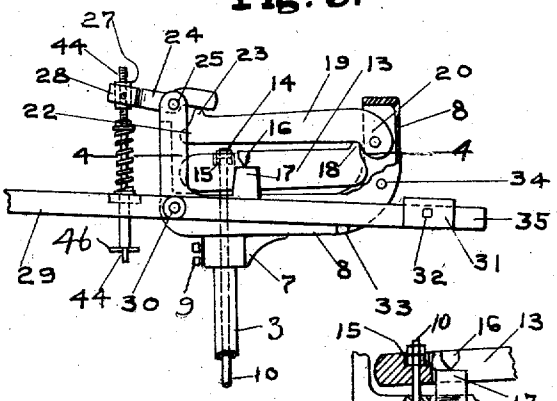


Fig. 2.

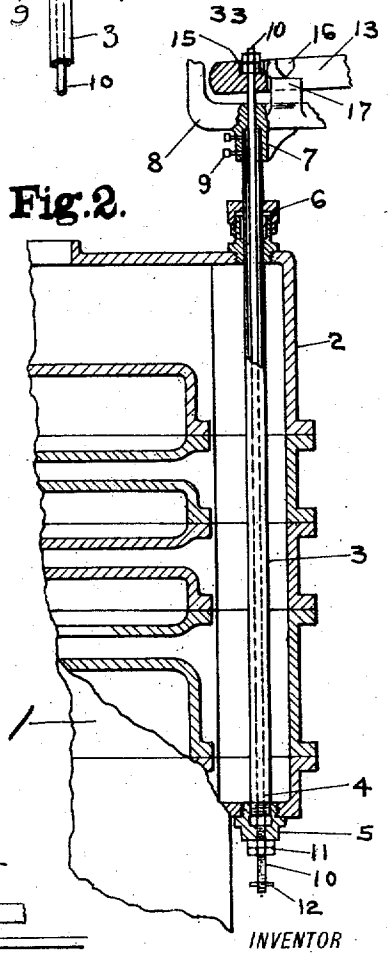


Fig. 4.

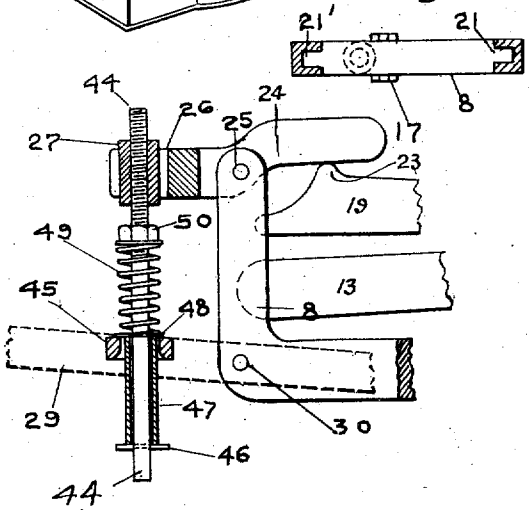
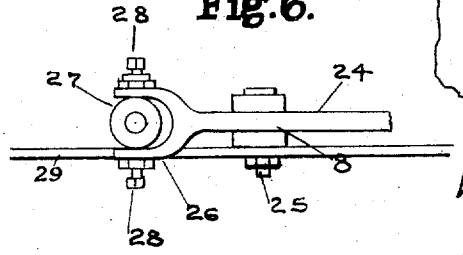


Fig. 5.

Fig. 6.



WITNESSES

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2 SHEETS—SHEET 2.

Fig. 7.

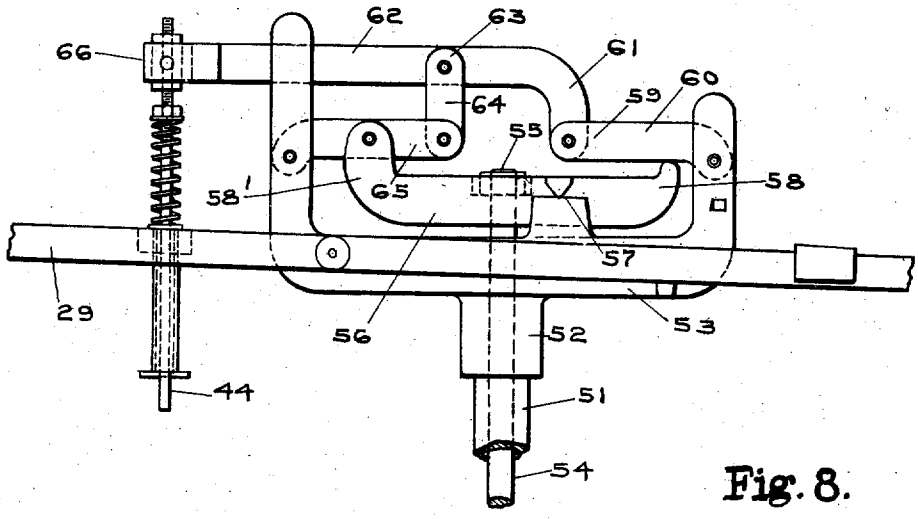
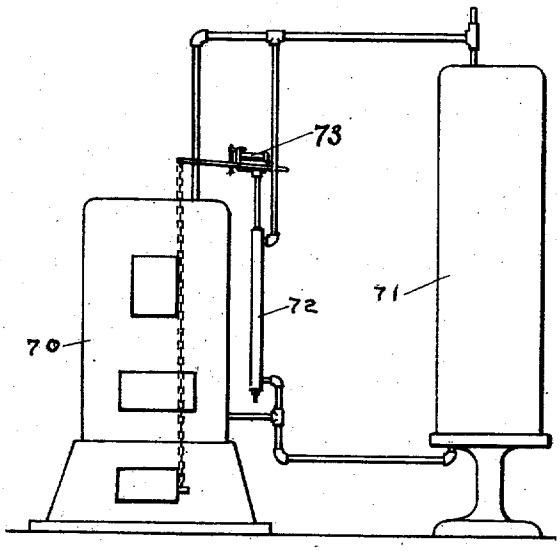


Fig. 8.



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UNITED STATES PATENT OFFICE.

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AUTOMATIC DAMPER-REGULATOR.

986,658. Specification of Letters Patent. Patented Mar. 14, 1911.

Application filed February 7, 1910. Serial No. 542,571.

To all whom it may concern:

Be it known that I, WILLIAM J. TURNER, a citizen of the United States of America, residing at the city of Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Automatic Damper-Regulators, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to heat regulators more particularly for automatically operating and controlling the dampers of hot-water boilers, and the object of the invention is to provide a simple and effective regulator, operated by the difference of expansion between two metals, adapted to be readily attached to any hot water boiler, the same being provided with means whereby the device may be readily adjusted and set to operate the dampers at any predetermined temperature and so automatically maintain the water in the boiler at any given degree of heat.

The device may be attached to a boiler having a water leg formed integral with the body portion thereof, or a separate and independent water tube or leg may be formed and connected to the boiler, or into the system between the supply and return adjacent the boiler, in such a manner as to cause the water to circulate therethrough to act upon the expansive metal, or the device may be applied to a tank heater, if desired.

An essential feature of this attachment is that a set of levers are arranged to greatly multiply the motion due to the difference of expansion between the two metals, and so provide in a simple and positive manner, sufficient movement for suitably operating the dampers of the heater.

With these and other objects in view, the invention consists of certain novel features of construction, as will be more fully described and particularly pointed out in the appended claims.

In the accompanying drawings: Figure 1— is a perspective view illustrating my improved device as attached to a hot water boiler. Fig. 2— is a sectional view through the water leg communicating with the boiler, showing one arrangement in which the two rods or members of different expansive qualities may extend through said water leg, one of said members coming in contact with the water therein, and the means of connecting said members so as to operate the actuating levers. Fig. 3— is an enlarged view of the lever frame and the coöperating levers mounted therein. Fig 4— is a detail plan view sectioned on line 4—4 of Fig. 3 showing the lever frame with the levers removed. Fig. 5— is an enlarged detail view in side elevation, partly in section, showing a portion of the lever frame and the adjustable screw rod for controlling the operation of the dampers. Fig. 6— is a fragmentary plan view showing the yoke lever in which the screw receiving nut or block is pivotally held. Fig. 7— is a modification illustrating another arrangement of levers through which the damper is operated by the expansion of two different metals. Fig. 8— illustrates my improved device as connected to the circulating pipes of a hot water tank or heating system and arranged to control the dampers of the boiler.

Referring to the drawings, 1 designates the boiler which, as illustrated in Figs. 1 and 2, is provided with an integral intercommunicating water leg 2 through which a tube 3, preferably of brass or of other suitable material of comparatively high expansive qualities when subjected to heat, is shown as extending. This tube, see Fig. 2, is threaded or otherwise secured at its lower end 4, preferably into the fitting 5 and extends up through the water leg and through the packing gland 6, its upper end being securely fastened to the boss 7 of the lever frame 8 by being threaded therein or securely held by set screws 9. This lever frame 8 is preferably of a wide-mouthed U-shape construction, both legs of which are preferably partially hollow or provided with a groove as at 21 and 21′ in the interior surfaces of each of its upwardly extending arms for the reception of the ends of the motion increasing lever arms hereinafter described. A small rod 10 preferably of iron or other metal of comparatively low expansive quality extends through said tube and is fastened by being threaded into the fitting 5 or this rod may extend through said fitting and be secured by means of nuts 11, if desired. The extreme lower end of said rod

is provided with a pin 12, or other suitable handle by which the same may be adjusted so as to readily set the levers and mechanism in the desired position. The upper end of this rod extends through the lever frame 8 also through the lower lever 13 and is provided with a nut and check nut 14 which are set in a little pocket 15 in the upper edge of said lever. This lever is shown as being pivotally supported on the knife edge fingers 16 which rests on the boss 17 extending upward from the lever frame 8, but the lever may be pivoted in this frame on a pin, if desired. A small protuberance 18 at the upper outer edge of this lever 13 engages the underside of a second lever 19 near its pivoted end 20, said latter lever then extends back arcoss the frame over the first lever, the free end of each being arranged to extend into grooves 21 and 21′, respectively, to support them against lateral motion. The protuberance 23 on the outer end of lever 22 is arranged to engage the inner end of the outwardly extending lever 24 which is pivoted at 25 in the upper end of the lever frame. The outer end of this lever 24 is preferably forked as at 26, see Fig. 6, for the purpose of receiving the screw threaded nut 27 which is pivotally mounted at 28—28 therein.

A substantially horizontal bar 29 is pivoted near its middle at 30 to the lower portion of the lever frame, the inner end 35 of which is provided with a counterbalance weight 31 secured in position by set-screw 32. Stop lugs 33 and 34 are located on the frame for limiting both the downward and upward motions of this end of said bar. The outer end 36 may be connected direct to the dampers (see Fig. 8) or as illustrated in Fig. 1, may be connected by means of the chain 37 to an auxiliary bar 38 pivoted at 39, the opposite ends of which bar being connected through chains 40 and 41, respectively, to the front and back dampers 42 and 43 of the boiler 1. In order that the heat upon rising to a predetermined temperature in the boiler should close or regulate these dampers by the action of the expanding metals through the levers, as above described, I have provided a connecting rod 44, see Figs. 3 and 5, for transmitting the motion of said levers to the damper controlling bar 29, which rod passes loosely through the eye of the boss 45 in said bar 29 and is threaded at its upper end through the nut 27, the lower end being provided with a pin 46, or other suitable handle, through which the screw rod may be turned for the purpose of adjustment. When the thermostat expands the action on the levers 13, 19 and 24 is such as to increase the tension on the spring 49 until the pressure on the forward end of lever 29 overcomes the counterweight 31 and permits the dampers to close. When the thermostat contracts the tension on the spring decreases until the counterweight 31 again becomes effective, whereupon lever 29 will be operated to open the dampers. A piece of tubing 47 extends upward on said rod for a short distance forming a shoulder on the upper end of which rests a washer 48, the same being large enough to engage the upper face of the boss 45 on the bar 29 and is yieldably held in position by means of the spring 49. The upper end of this spring rests against the washer on the underside of the nut 50 whereby its tension may be adjusted.

Fig. 7— illustrates another arrangement of stroke multiplying levers, the outer expansion tube 51 being attached at 52 to the lever frame 53, while the inner tie rod 54 is connected at 55 to the lever 56, which lever is pivotally hung at 57 to the frame. One end 58 of this lever, as the tube 51 expands, tips up and raises the free end 59 of the pivoted lever 60, which latter lever in turn raises the end 61 of the lever 62 which is fulcrumed at 63. This fulcrum point at the same time is carried downward through the link 64 and lever 65 by the downward movement of the end 58′ of lever 56, thereby imparting a double or greatly increased motion to the outer or bar actuating end 66 of the lever 62. This latter lever may be connected in the manner above described through the screw rod 44, to the damper actuating bar 29.

Another arrangement of heating apparatus to which my device may be attached is illustrated in Fig. 8 in which 70 is the boiler, and 71 is the tank, the water in which is heated from said boiler, and 73 represents my regulator applied to an auxiliary water leg 72 inserted into the water circuit between the supply and return pipes at or near the boiler for the purpose of automatically controlling the dampers on the boiler 70, but substantially this same method of connecting my regulating device to the main supply and return to the boiler may be employed in any heating system.

In operating the device the chains 40 and 41 are connected to the usual boiler dampers which being counterbalanced by the weights 73 and 74 on bar 38 in Fig. 1, serve to hold said dampers normally in their open position until such time as the temperature of the water in the boiler is raised to a point sufficient to expand the brass tube and cause the same to move upward through its packing box 6, and raise the lower frame. The center or tie rod 10 being constructed of much less expansive metal remains practically in a fixed position and as the frame moves upward that end of the lever 13 to which the tie rod is connected remains substantially stationary, thereby causing the free end to move upward which in turn, through the movement of multiplying levers 19 and 24 presses

downward the damper bar 29 through the screw rod 44 closing or regulating said dampers to keep the heat at a constant predetermined temperature. When it is desired that the temperature should be raised to a higher point before the dampers shall be closed, the screw rod 44 is turned upward thereby opening the dampers still more and requiring a greater movement of the levers in order to close them. The reverse effect is obtained by lengthening the screw rod whereby the dampers will commence to close earlier or when a lower temperature is reached.

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

1. A damper regulator for boilers comprising a thermostat formed of two coacting members, a yoke rigidly connected to one of said members, an actuating lever pivotally supported by said yoke and connected with the other thermostat member, a damper controlling lever provided with a counterbalance, a spring acting on said damper controlling lever in opposition to said counterbalance, and means operatively connected with said actuating lever for automatically varying the tension on said spring.

2. A damper regulator for boilers comprising a thermostat formed of two coacting members, a yoke rigidly connected to one of said members, an actuating lever pivotally supported by said yoke and connected with the other thermostat member, a damper controlling lever provided with a counterbalance, a rod slidingly connected with said damper controlling lever and provided with an abutment, a spring encircling said rod and interposed between said abutment and said damper controlling lever, and means operatively connected with said actuating lever for shifting said rod.

3. A damper regulator for boilers comprising a thermostat formed of two coacting members, a yoke rigidly connected to one of said members, an actuating lever pivotally supported by said yoke and connected with the other thermostat member, a damper controlling lever provided with a counterbalance, a rod slidingly connected with said damper controlling lever and provided with an abutment, a spring encircling said rod and interposed between said abutment and said damper controlling lever, and means operatively connected with said actuating lever for shifting said rod, and means for adjusting said rod relative to said shifting means.

4. A damper regulator for boilers comprising a thermostat formed of two coacting members, a yoke rigidly connected to one of said members, an actuating lever pivotally supported by said yoke and connected with the other thermostat member, a damper controlling lever provided with a counterbalance, a sleeve mounted on said lever, a rod slidingly mounted in said sleeve and provided with an abutment, means for limiting the movement of said rod, a spring encircling said rod and interposed between said abutment and said damper controlling lever, and means operatively connected with said actuating lever for shifting said rod.

5. A damper regulator for boilers comprising a thermostat formed of two coacting members, a yoke rigidly connected to one of said members, an actuating lever pivotally supported by said yoke and connected with the other thermostat member, a damper controlling lever provided with a counterbalance, a shifting lever, a rod suspended from said shifting lever and slidingly engaging said damper controlling lever, said rod having an abutment, and a spring encircling said rod and interposed between said abutment and said damper controlling lever, said shifting lever being operatively connected with said actuating lever.

6. A damper regulator for boilers comprising a thermostat formed of two coacting members, a yoke rigidly connected to one of said members, an actuating lever pivotally supported by said yoke and connected with the other thermostat member, a damper controlling lever provided with a counterbalance, a shifting lever, a rod suspended from said shifting lever and slidingly engaging said damper controlling lever, said rod having an abutment, and a spring encircling said rod and interposed between said abutment and said damper controlling lever, said shifting lever being operatively connected with said actuating lever, and means for adjusting said rod with relation to said shifting lever.

7. A damper regulator for boilers comprising a thermostat formed of two coacting members, a yoke rigidly connected to one of said members, an actuating lever pivotally supported by said yoke and connected with the other thermostat member, a damper controlling lever provided with a counterbalance, a shifting lever operatively connected with said actuating lever, a threaded nut pivotally mounted in said shifting lever, a threaded rod engaging said nut and provided with an abutment, and a spring encircling said rod and interposed between said abutment and damper controlling lever.

8. A damper regulator for boilers comprising a thermostat formed of two coacting members, a yoke rigidly connected to one of said members, an actuating lever pivotally supported by said yoke and connected with the other thermostat member, a damper controlling lever provided with a counterbalance, a shifting lever operatively connected with said actuating lever, a rod adjustably connected with said shifting lever,

an adjustable abutment on said rod, and a spring interposed between said abutment and said damper controlling lever.

9. A damper regulator for boilers comprising a thermostat formed of two coacting members, a yoke rigidly connected with one of said members, an actuating lever pivotally supported by said yoke and connected with the other thermostat member, means engaging the ends of said lever for preventing lateral movement thereof, a damper controlling lever supported by said yoke and provided with a counterbalancing weight, a spring acting on said damper controlling lever in opposition to said counterbalance, and means operatively connected with said actuating lever for automatically varying the tension on said spring.

10. A damper regulator for boilers comprising a thermostat formed of two coacting members, a U-shaped yoke rigidly connected with one of said members and provided with central supports, an actuating lever pivotally supported by said supports and connected with the other thermostat member, the arms of said yoke being provided with means for preventing lateral movement of the end of said lever, a damper controlling lever pivotally supported by said yoke and provided with a counterbalance, a spring acting on said damper controlling lever in opposition to said counterbalance, and means operatively connected with said actuating lever for automatically varying the tension on said spring.

11. A damper regulator for boilers comprising a thermostat formed of two coacting members, a U-shaped yoke rigidly connected with one of said members and provided with central supports, an actuating lever pivotally supported by said supports and connected with the other thermostat member, the arms of said yoke being provided with grooves to receive the ends of said lever, a damper controlling lever pivotally supported by said yoke and provided with a counterbalance, a spring acting on said damper controlling lever in opposition to said counterbalance, and means operatively connected with said actuating lever for automatically varying the tension on said spring.

12. A damper regulator for boilers comprising a thermostat formed of two coacting members, a U-shaped yoke rigidly connected with one of said members, and provided with central supports, an actuating lever pivotally supported by said support and connected with the other thermostat member, the arms of said yoke being provided with grooves to receive the ends of said lever, a damper controlling lever pivotally supported by said yoke and provided with a counterbalance, multiplying levers also supported by said yoke and having their ends also mounted in said grooves, said multiplying levers being operatively connected with said actuating lever, a spring acting on said damper controlling lever in opposition to said counter-balance, and means controlled by said multiplying levers for varying the tension on said spring.

13. A damper regulator for boilers comprising a thermostat formed of two coacting members, a U-shaped yoke rigidly connected with one of said members and provided with central supports, an actuating lever pivotally supported by said supports and connected with the other thermostat member, the arms of said yoke being provided with grooves to receive the ends of said lever, a damper controlling lever pivotally supported by said yoke and provided with a counterbalance, multiplying levers also supported by said yoke and having their ends also mounted in said grooves, said multiplying levers being operatively connected with said actuating lever, a spring acting on said damper controlling lever in opposition to said counterbalance, and a shifting lever provided with means for varying the tension on said spring, said shifting lever having an offset portion engaging one of said multiplying levers.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM J. TURNER.

Witnesses:

HOWARD E. BARLOW,

E. I. OGDEN.