

May 16, 1933.

H. F. FERGUSON
FURNACE CONTROL DEVICE

1,908,702

Filed March 9, 1932

2 Sheets-Sheet 1

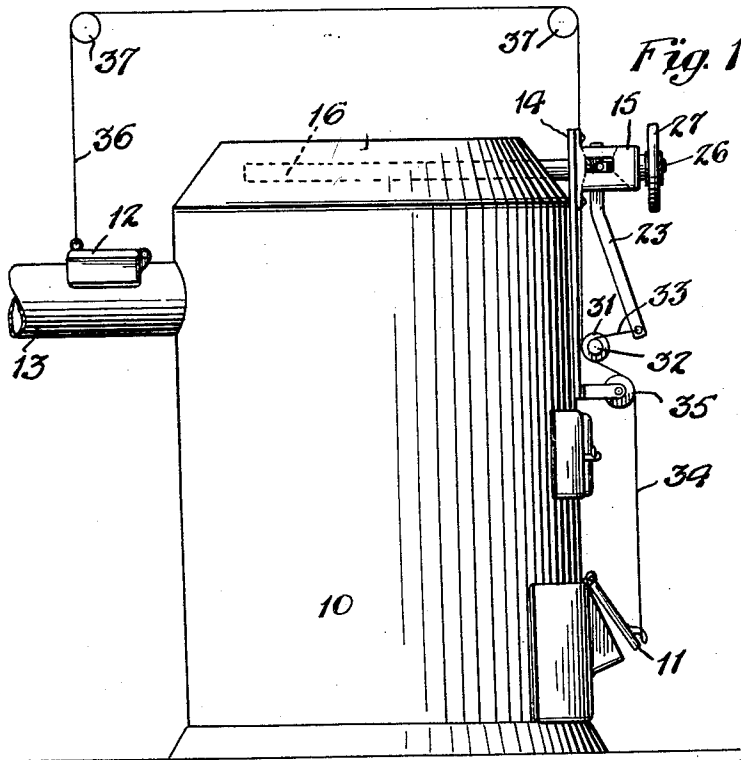


Fig. 4

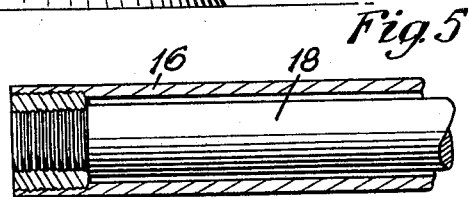
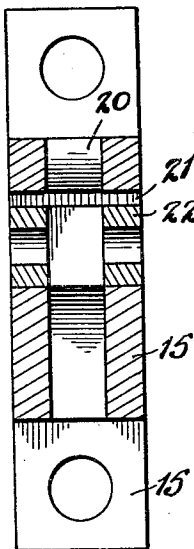


Fig. 6

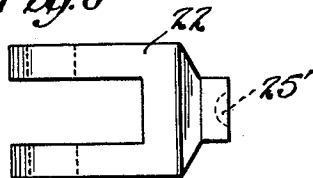


Fig. 8

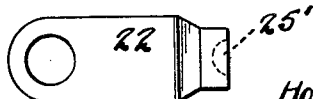
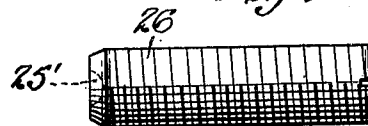


Fig. 7

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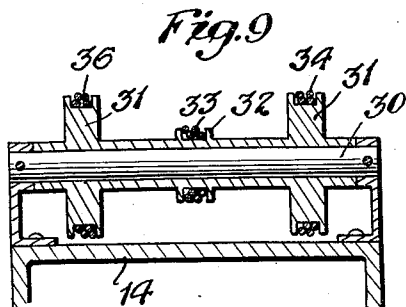
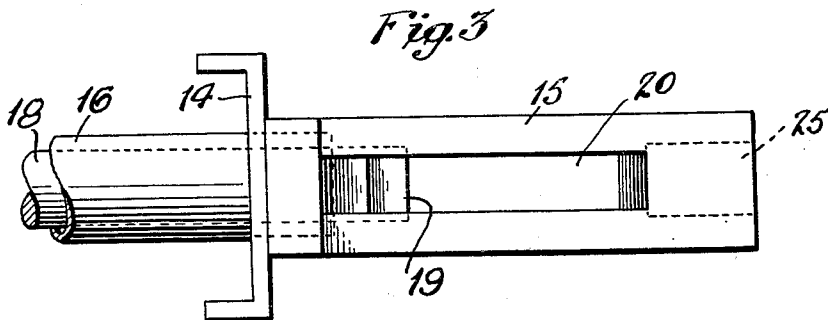
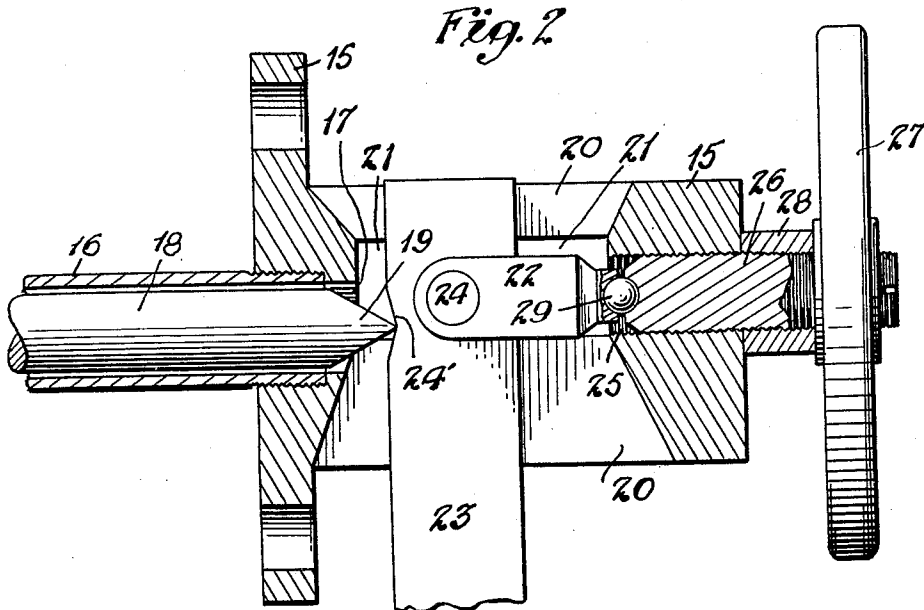
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2 Sheets-Sheet 2



Inventor
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UNITED STATES PATENT OFFICE

HOWARD F. FERGUSON, OF YOUNGSTOWN, OHIO

FURNACE CONTROL DEVICE

Application filed March 9, 1932. Serial No. 597,826.

My invention relates to a device for regulating and controlling a furnace or the like although not necessarily restricted to this use.

5 An important object of my invention is the provision of a device of this character which is automatic in operation and which will effectively regulate a furnace.

Another object of my invention is to provide a device of this character which may be readily attached to various types of furnaces, which is inexpensive to manufacture and install, simple in construction and operation, strong and durable.

15 Other objects and advantages of my invention will be apparent during the course of the following description.

In the accompanying drawings which form a part of this specification and wherein like characters of reference denote like parts throughout the same,

Figure 1 is an elevation of a furnace having my invention applied thereto,

25 Figure 2 is a vertical sectional view through the body portion of my attachment,

Figure 3 is a plan view thereof with the lever, clevis and clevis adjusting member removed,

30 Figure 4 is a transverse section there-through showing the clevis in position,

Figure 5 is a detail of the end of the thermal element,

Figure 6 is a plan view of the clevis,

Figure 7 is an elevation thereof,

35 Figure 8 is an elevation of the adjusting bolt, and,

Figure 9 is a horizontal section showing the arrangement of pulleys.

40 In the drawings, wherein for the purpose of illustration is shown a preferred embodiment of my invention the numeral 10 designates a furnace having a draft door 11, and having a check draft 12 arranged on the flue 13. The furnace 10 may be of any suitable construction and type and forms no part of the present invention.

50 My furnace regulator is mounted on a suitable vertically arranged bracket 14 which comprises an upright which is channel shaped and secured to the upper portion

of the furnace above the draft door 11 and preferably in vertical alignment therewith. A flanged body member 15 has its flanges bolted to the bracket 14 at the upper end thereof, and extends radially away from the furnace as seen in Figure 1. A thermal responsive member comprises a tube 16 of brass, copper, aluminum or other metal having a relatively high coefficient of expansion which extends through an opening in the bracket 14 and is screw threadedly received in an opening 17 in the body member 15. The tube 16 extends into the upper portion of the furnace for a substantial distance and a rod 18 is rigidly secured to the inner end of the tube as shown in Figure 5 and extends through the tube and into the body member 15 through the opening 17. The rod 18 is of invar steel or other suitable material having a low coefficient of expansion and the end which projects through the openings 17 is provided with a chisel point 19, for a purpose to be hereinafter described.

The body member 15 is provided with a vertical slot 20 extending entirely there-through and with a horizontal slot 21 also extending therethrough and communicating with the vertical slot 20. A clevis member 22 is arranged in the slot 21 and rests on the bottom thereof, there being a space between the top of the clevis and the top of the slot 21 to allow freedom of movement of the clevis in the slot. A lever 23 extends through the vertical slot 20 and is pivoted at 24 between the arms of the clevis. The lever extends to the top of the body member 15 and has a V-shaped depression 24' in one edge thereof to engage the chisel point 19 of the rod 18. The sides of the slot 20 are inclined away from the center of the body member above and below the slot 21 to allow freedom of movement of the lever about the pivot 24.

The outer portion of the body member is provided with a horizontal screw threaded bore 25 which connects the slot 20 with the end of the body member and receives an adjusting bolt 26. An adjusting wheel 27 is screw-threadedly mounted adjacent the outer end of the bolt 26 and is spaced from the body

member by means of a suitable screw-threaded jam nut or bushing 28. The inner end of the bolt 26 and the outer end of the clevis are provided with cup shaped depressions 25' which engage a ball bearing 29 which spaces the clevis and bolt and allows pivotal movement of the clevis about the ball 29.

In operation the bolt 26 is moved by means of the wheel 27 to the desired position and the clevis 22 acting as a crosshead will force the lever 23 against the chisel point 19 of the rod.

The lever extends a substantial distance below the body member 15 and is bent away from the furnace. A shaft 30 is supported by the bracket 14 in spaced relation thereto and rotatably supports two large pulleys 31 and a small pulley 32, all of which are interconnected to rotate together. The small pulley 32 has a cable 33 wound thereon and connected to the lower end of the lever 23. One of the large pulleys 31 has a cable 34 wound thereon and passes over an idling pulley 35 to the draft door 11 to which it is connected. A cable 36 is wound about the other pulley 31 and passes over idling pulleys 37 to the check draft 12 to which it is connected.

In operation, when the temperature within the furnace lowers, the tube 16 contracts, forcing the rod 18 against the lever 23 and moving it about its pivot. This movement moves the lower end of the lever away from the furnace, thereby rotating the pulley 32 which in turn rotates the large pulleys 31 to close the check draft and open the draft door 11. The movement of the rod 18 is magnified by the lever 23 and is further magnified by the difference between the size of the pulleys 31 and 32. As the temperature within the furnace rises the tube expands and retracts the rod 18 to which it is attached, and allows the weight of the lever 23 and door 11 to close the door 11 and open the check draft 12.

In place of the pulleys 31 and 32 I may use any other arrangement for transmitting movement of the lever to the doors, such as a segment and pinion connected to the lever or any other suitable means. The arrangement of the pulleys to magnify the movement of the lever permits the use of a much shorter lever than would otherwise be possible.

My attachment automatically controls the temperature of the furnace and will maintain an even heat at all times. This attachment may be used with any type of furnace and the tube 16 may be inserted in any convenient portion of the furnace, or in a flue or steam pipe. By providing an even temperature within the furnace the fuel will be burned under the most economical conditions, and dangers from overheating and underheating will be avoided.

The position of the fulcrum 24 may be adjusted by the hand wheel 27 and the freedom

of movement of the clevis about the ball 29 permits self alignment of the clevis with the chisel point 19, thereby permitting a change in the distance between the horizontal planes of the two fulcrum points formed by the bolt 24 and the chisel point 19.

While I prefer to multiply the movement of the lever by means of pulleys or other suitable means, I may omit this mechanism and rely on the length of the multiplying lever 23 to produce this result.

In applying this attachment to any type of furnace, the only change to the furnace is the bolting of the bracket thereto and the boring of an opening to receive the tube 16. If the attachment cannot be arranged in alignment with the draft door 11 suitable pulleys or the like may be added to bring the cable 34 into alignment with the door.

While I have shown and described the preferred embodiment of my invention, it is to be understood that various changes in the size, shape and arrangement of parts may be resorted to without departing from the spirit of my invention or the scope of the subjoined claims.

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

1. The combination with a furnace, of a thermally controlled regulator comprising a body member having a slot therein, a thermally operated member projecting into said slot, a regulating lever extending into said slot and engaging the thermally operated member, and a lever supporting member pivotally connected to said lever at a point spaced from the axis of the thermally operated member and supported in said slot, said lever supporting member being free to move within limits in the direction of the axis of said lever.

2. The combination with a furnace, of a thermally controlled regulator comprising a body member having a slot therein, a thermally operated member projecting into said slot, a regulating lever extending into said slot and engaging the thermally operated member, a lever supporting member pivotally connected to said lever at a point spaced from the axis of the thermally operated member and supported in said slot, said lever supporting member being free to move in the direction of the axis of said lever, and means to adjust the lever supporting member in a direction at substantially a right angle to the lever axis.

3. The combination with a furnace, of a thermally controlled regulator comprising a body member having a slot therein, a thermally operated member projecting into said slot, a regulating lever extending into said slot and engaging the thermally operated member, and a clevis pivotally supported in said slot and pivotally engaging said lever

at a point spaced from the plane of the axis of said thermally operated member.

4. The combination with a furnace, of a thermally controlled regulator comprising a body member having a slot therein, a thermally operated member projecting into said slot, a regulating lever extending into said slot and engaging the thermally operated member, a clevis pivotally supported in said slot and pivotally engaging said lever at a point spaced from the plane of the axis of said thermally operated member, and means to adjust the clevis toward and away from the thermally operated member.

5. The combination with a furnace, of a thermally controlled regulator comprising a body member having a substantially vertical slot extending therethrough said body member having a substantially horizontal slot extending therethrough and communicating with the vertical slot, a thermally operated member extending into said vertical slot, a regulating lever extending through the vertical slot and engaging the thermally operated member, and a clevis arranged in said horizontal slot and resting on the bottom thereof, said clevis pivotally supporting the lever, and said clevis being free to move vertically in said horizontal slot.

6. The combination with a furnace, of a thermally controlled regulator comprising a body member having a substantially vertical slot extending therethrough, said body member having a substantially horizontal slot extending therethrough and communicating with the vertical slot, a thermally operated member extending into said vertical slot, a regulating lever extending through the vertical slot and engaging the thermally operated member, a clevis arranged in said horizontal slot and resting on the bottom thereof, said clevis pivotally supporting the lever, and said clevis being free to move vertically in said horizontal slot, and means to adjust said clevis toward and away from the thermally operated member.

7. The combination with a furnace, of a thermally controlled regulator comprising a body member having a substantially vertical slot extending therethrough, said body member having a substantially horizontal slot extending therethrough and communicating with the vertical slot, a thermally operated member extending into said vertical slot, a regulating lever extending through the vertical slot and engaging the thermally operated member, a clevis arranged in said horizontal slot and resting on the bottom thereof, said clevis pivotally supporting the lever, and said clevis being free to move vertically in said horizontal slot, and an adjusting bolt pivotally engaging said clevis and adapted to adjust said clevis toward and away from the thermally operated member.

8. The combination with a furnace having

a draft door and a check valve, of a thermally controlled regulator comprising a body member having a substantially vertical slot extending therethrough, said body member having a substantially horizontal slot extending therethrough and communicating with the vertical slot, a thermally operated member extending into said vertical slot, a regulating lever extending through the vertical slot and engaging the thermally operated member, a clevis arranged in said horizontal slot and resting on the bottom thereof, said clevis pivotally supporting the lever and being free to move vertically in said horizontal slot, and means operatively connecting the regulating lever with the draft door and check valve of the furnace.

9. The combination with a furnace having a draft door and a check valve, of a thermally controlled regulator comprising a body member having a substantially vertical slot extending therethrough, said body member having a substantially horizontal slot extending therethrough and communicating with the vertical slot, a thermally operated member extending into said vertical slot, a regulating lever extending through the vertical slot and engaging the thermally operated member, a clevis arranged in said horizontal slot and resting on the bottom thereof, said clevis pivotally supporting the lever and being free to move vertically in said horizontal slot, means operatively connecting the regulating lever with the draft door and check valve of the furnace, and means to adjust the clevis toward and away from the thermally operated member.

10. The combination with a furnace having a draft door and a check valve, of a thermally controlled regulator comprising a body member having a substantially vertical slot extending therethrough, said body member having a substantially horizontal slot extending therethrough and communicating with the vertical slot, a thermally operated member extending into said vertical slot, a regulating lever extending through the vertical slot and engaging the thermally operated member, a clevis arranged in said horizontal slot and resting on the bottom thereof, said clevis pivotally supporting the lever and being free to move vertically in said horizontal slot, and means operatively connecting the regulating lever with the draft door and check valve of the furnace, said thermally operated member comprising a rod having a relatively low coefficient of expansion and supported in a tube having a relatively high coefficient of expansion.

11. The combination with a furnace having a draft door and a check valve, of a thermally controlled regulator comprising a body member having a substantially vertical slot extending therethrough, said body member having a substantially horizontal slot extending

therethrough and communicating with the vertical slot, a thermally operated member extending into said vertical slot, a regulating lever extending through the vertical slot and
 5 engaging the thermally operated member, a clevis arranged in said horizontal slot and resting on the bottom thereof, said clevis pivotally supporting the lever and being free to move vertically in said horizontal slot, and
 10 means operatively connecting the regulating lever with the draft door and check valve of the furnace, said thermally operated member comprising a rod having a relatively low coefficient of expansion and supported in a
 15 tube having a relatively high coefficient of expansion, said tube being supported by said body member and extending into the furnace for a substantial distance.

12. The combination with a furnace, of a
 20 thermally controlled regulator comprising a body member having a substantially vertical slot extending therethrough said body member having a substantially horizontal slot extending therethrough and communicating
 25 with the vertical slot, a thermally operated member extending into said vertical slot, a regulating lever extending through the vertical slot and engaging the thermally operated member, a clevis arranged in said horizontal
 30 slot and resting on the bottom thereof, said clevis pivotally supporting the lever, and said clevis being free to move vertically in said horizontal slot, said thermally operated member comprising a rod having a relatively low
 35 coefficient of expansion and supported in a tube having a relatively high coefficient of expansion.

13. The combination with a furnace, of a
 40 thermally controlled regulator comprising a body member having a substantially vertical slot extending therethrough, said body member having a substantially horizontal slot extending therethrough and communicating
 45 with the vertical slot, a thermally operated member extending into said vertical slot, a regulating lever extending through the vertical slot and engaging the thermally operated member, a clevis arranged in said horizontal
 50 slot and resting on the bottom thereof, said clevis pivotally supporting the lever, and said clevis being free to move vertically in said horizontal slot, said thermally operated member comprising a rod having a relatively
 55 low coefficient of expansion and supported in a tube having a relatively high coefficient of expansion, said tube being supported by said body member and extending into the furnace for a substantial distance.

14. The combination with a furnace, of a
 60 thermally controlled regulator comprising a body member having a slot therein, a thermally operated member projecting into said slot, a regulating lever extending into said slot and engaging the thermally operated
 65 member, and a self adjusting crosshead supported

ported in said slot and pivotally engaging said lever at a point spaced from the axis of said thermally operated member.

15. The combination with a furnace, of a
 70 thermally controlled regulator comprising a body member having a slot therein, a thermally operated member projecting into said slot, a regulating lever extending into said slot and engaging the thermally operated
 75 member, a self adjusting crosshead supported in said slot and pivotally engaging said lever at a point spaced from the axis of said thermally operated member, and means to adjust the crosshead toward and away from the
 80 thermally operated member.

16. The combination with a furnace, of a
 85 thermally controlled regulator comprising a body member, a regulating lever pivotally supported in said body member, a thermally operated member engaging said lever at a point spaced from the pivot point of the lever and adapted to move the lever about its pivot, and means permitting substantially free
 90 movement of the lever pivot in the direction of the lever axis.

17. The combination with a furnace, of a
 95 regulator comprising a body member, a regulating lever pivotally supported in said body member, a thermally operated member engaging said lever at a point spaced from the pivotal point of the lever and adapted to move the lever about its pivot, means permitting free movement within limits of the lever pivot away and toward the axis of the
 100 thermally operated member, and means to adjust the lever pivot toward and away from the thermally operated member.

In testimony whereof I affix my signature.
 HOWARD F. FERGUSON.

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