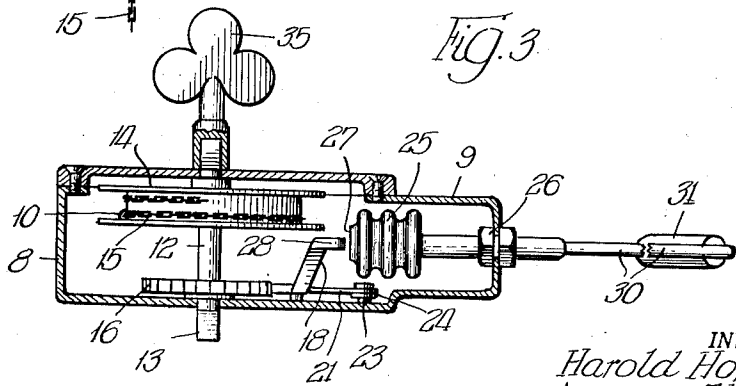
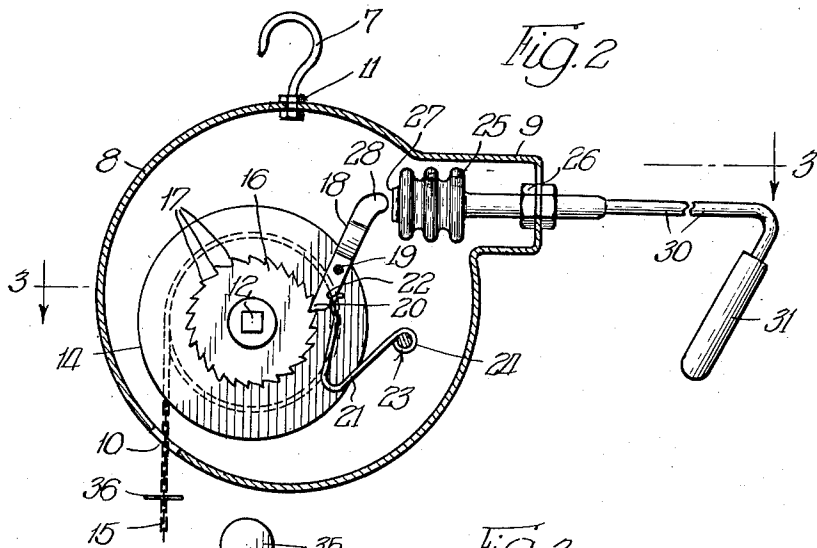
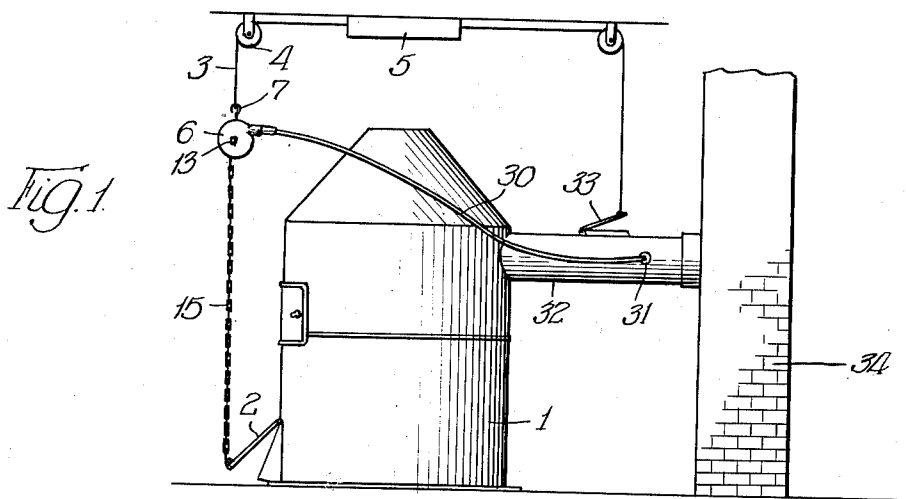


March 4, 1952

H. HOPTON ET AL
DRAFT REGULATOR

2,588,239

Filed Dec. 3, 1949



INVENTOR.
Harold Hopton,
BY Lawrence T. Wahlstrom,
George S. Hargis &
George H. Simmons, attys.

UNITED STATES PATENT OFFICE

2,588,239

DRAFT REGULATOR

Harold Hopton, Bismarck, N. Dak., and Lawrence
T. Wahlstrom, Chicago, Ill.

Application December 3, 1949, Serial No. 130,942

7 Claims. (Cl. 74—2)

1

This invention relates to safety devices for furnace draft doors and has for its principal object the provision of a new and improved device of this kind.

Another object of the invention is to provide a safety device which will allow the furnace draft door to close automatically at a predetermined temperature and which device can be used in conjunction with existing apparatus for operating furnace draft doors.

A further object of the invention is to provide a safety device for furnace draft doors which can be installed as an accessory to any furnace with a minimum of effort and alteration to the furnace.

A further object of the invention is to provide a furnace draft door safety device which will operate independently of either automatic or manual devices for manipulation of the draft door and thereby insure its safety in operation, regardless of the operating position of the principal draft door control means.

A still further object of the invention is to provide a safety device for furnace draft doors which has a minimum number of parts and can be manufactured at low cost without sacrificing quality.

Further objects of the invention not specifically mentioned here will be apparent from the detailed description and claims which follow, reference being had to the accompanying drawings in which:

Fig. 1 is a view of a furnace having the draft door safety device embodied therewith;

Fig. 2 is a plan view of the draft door safety device shown to an enlarged scale with certain portions cut away the better to show the invention; and

Fig. 3 is a top view of the safety device taken along lines 3—3 of Fig. 2 and looking in the direction of the arrows.

In the prior art of which we are aware, there are many devices for regulating the draft door of furnaces. Generally they are of two types: first, thermostatic devices located remotely of the furnace and operated to open and close the draft door to control the furnace fire and maintain the area heated by the furnace at a desired temperature; and, second, devices attached to the furnace and controlled by various temperature-responsive means inserted either in the fire box or within the furnace jacket. These devices are not wholly satisfactory, for in certain instances they permit an unsafe condition to exist in the furnace, and a freely drafted fire may run away and extend itself into the stack pipe and

2

ignite the soot and residue in the stack. In such instances, because the fire is of such rapid expansion, neither the temperature of the air within the furnace jacket or of the area being heated by the furnace is increased to a degree high enough to activate the heat-responsive devices and such devices will not act to shut the draft and retard such a fire.

In thermostatically controlled draft controls which react to room temperature, it frequently happens that because of an open door or window the control unit keeps the draft open and allows the fire to burn too briskly for safe operation and a dangerous overheating of the furnace, and a stack fire may result. Similarly, an electric failure may cause such a control to keep the draft door open long enough to permit unsafe conditions to develop. In instances where drafts are controlled manually, the furnace is oftentimes forgotten and unsafe conditions allowed to develop. It is to providing a furnace draft door safety device that will operate effectively under the conditions mentioned that the present invention particularly relates.

The present invention provides for preventing unsafe conditions to develop by inserting in the draft chain an auxiliary device that is operated by a temperature-responsive device located at a critical point to lengthen the chain and thereby close the draft when the temperature at that point exceeds a safe value.

Referring now to the drawings in more detail. In Fig. 1, we have shown the safety device applied to conventional type of hot air furnace 1, having the usual draft door 2 connected to the furnace 1 along its upper edge so that it tends to close. Draft door 2 is operated by chain or similar tension device 3 connected thereto and passing upwardly over a pulley 4 to a suitable regulating device 5 of either the manual or automatic type.

The safety device, indicated generally at 6, is carried by chain 3 between pulley 4 and door 2 by a hook 7, allowing the device 6 to travel with chain 3 as it is raised and lowered to open and close the door 2. As shown in Figs. 2 and 3, the device comprises a cylindrical watchcase-like housing 8 having a cylindrical projection 9 extending tangentially therefrom and having a generally circular opening 10 in the lower portion thereof. A hook 7 is connected to the top of housing 8 in any suitable manner, such as by nuts 11.

A shaft 12 is rotatably mounted in housing 8 below the center thereof and on the side op-

3

posite extension 9, with squared ends 13 of the shaft 12 extending a short distance outside the housing. A reel 14, mounted on shaft 12 within housing 8, carries a flexible tension member, such as a chain 15, fixed thereto and wound therearound. The free end of the chain extends through opening 10 and is fastened to draft door 2 in any suitable manner. Ratchet wheel 16 is mounted in juxtaposition to reel 14 so that shaft 12, reel 14 and ratchet 16 operate as a unit.

The weight of the draft door 2 pulling on chain 15 tends to rotate the reel, shaft, and ratchet counterclockwise (Fig. 2) and this rotation is prevented by the engagement of a pawl 20 with the teeth 17 of the ratchet wheel. Pawl 20 is formed on the end of a lever 18 that is pivoted at 19 to the case 8. A spring 21, extending between a notch 22 in the pawl, and a post 23 carried by the housing is tensioned to maintain the pawl in engagement with the teeth.

An expansible bellows 25, such as a corrugated metal bellows, for example, is mounted by suitable means such as nuts 26 in the cylindrical extension 9 of housing 8. The free end 27 of bellows 25 abuts against the free end 28 of lever 18 and functions to move said lever 18 and pawl 20 out of engagement with ratchet 16, as will appear later. The bellows 25 is connected in a closed system through a suitable coupling and a flexible tubing 30 to an exposure bulb 31; and the bellows 25, tubing 30, and bulb 31 are filled with a gaseous fluid, such as carbon tetrachloride, for example, which expands upon being heated.

Exposure bulb 31 is shown mounted in stack pipe 32 between check draft 33 and the stack 34 by way of example only as other locations are contemplated. When the temperature in the stack pipe 32 reaches a predetermined temperature, the fluid in the system will have expanded, causing the bellows 25 to expand and shift lever 18 so as to move pawl 20, out of engagement with ratchet 16 thereby allowing reel 14 to rotate freely. The weight of door 2 and chain 15 cause the reel 14 to rotate and unwind chain 15, thereby allowing draft door 2 to close notwithstanding that the control means 5 may still be set for an open draft door.

To reset the safety device after it has operated and allowed the draft door 2 to close, chain 15 is wound onto reel 14 by a key 35 which engages the portion 13 of shaft 12 which extends through housing 8. The ratchet 16 and lever 18 coact in the usual manner to allow the reel 14 to rotate until the required length of chain 15 has been wound on reel 14. If desired, a suitable stop 36 may be placed in chain 15 so as to engage the housing 8 when the desired length of chain is on the reel 14.

As long as the stack temperature remains below the predetermined temperature, the reel 14 remains locked against rotation and the safety device 6 and chain section 15 move as a link of control chain 3 to permit normal operation of control means 5 and chain 3 in opening and closing the draft door 2.

The safety device of the present invention is possessed of many advantages. The safety device can be used in conjunction with any chain control furnace draft door regardless of whether normal operation of the draft door is controlled by thermostatic, automatic or manual means, and will operate independently of such means to close the draft door when a predetermined, dangerous temperature occurs in the stack. The temperature-responsive element of the device is located

4

in the stack and is controlled by the temperature thereof to insure protection of the stack when other portions of the furnace system may not be heated above normal operating temperatures and would not activate control devices normally dependent thereupon.

The device of this invention can readily be installed as an accessory to existing furnaces by the simplest of operations with a minimum of furnace alteration, and the safety device as described can be manufactured at low cost without sacrificing quality.

In the drawings and description, we have shown and described the invention as applied to a warm air furnace. As will be apparent to one skilled in the art, the invention may equally well be used in connection with other types of heating plants such as steam, vapor, or hot water.

While we have chosen to illustrate our invention by showing and describing a preferred embodiment of it, we have done so by way of example only, as there are many modifications and adaptations which can be made by one skilled in the art, within the teachings of the invention.

Having thus complied with the statutes, and shown and described a preferred embodiment of our invention, what we consider new and desire to have protected by Letters Patent is pointed out in the appended claims.

30 What is claimed is:

1. As an article of manufacture, a safety device for use with a furnace having a draft door which normally tends to close, comprising: a reel, means for supporting said reel by the draft door control chain, a flexible member connected to said reel and to said door, means for winding said flexible member onto said reel thereby to shorten the chain to permit it to open said door, means for locking said reel against counter rotation which would unwind said member, and temperature-responsive means for releasing said locking means thereby permitting the reel to rotate and the flexible member to unwind to close the draft door.

2. As an article of manufacture, a safety device for use with a furnace having a draft door which normally tends to close and which is operated by a flexible chain, comprising: a reel, means for supporting said reel on said chain, flexible means attached to said reel and said door, means for rotating said reel to shorten said flexible means thereby enabling said chain to open said door, means for holding said reel against counter rotation, and a temperature-responsive means for releasing said reel holding means at a predetermined temperature to permit rotation of the reel thereby lengthening said flexible means and allowing the draft door connected thereto to close.

3. An article of manufacture for use with a furnace having a draft door and a flexible chain control for said door, comprising: a housing adapted to be carried by said chain, a reel rotatably mounted in said housing, a section of said chain connected to said reel at one end and to said door at the other, means for turning said reel to wind said chain thereupon, a ratchet and lever means for locking said reel against counter rotation after winding, and a heat-responsive means for disengaging said locking means to allow rotation of said reel to unwind said connected chain and lower said draft door at a predetermined temperature.

4. An article of manufacture for use with a furnace having a draft door and a flexible chain

5

6

control for said door, comprising: a housing adapted to be carried by said chain, a reel rotatably mounted in said housing, a section of said chain connected to said reel at one end and to said door at the other, means for turning said reel to wind said chain thereupon, a ratchet and lever means for locking said reel against counter rotation after winding; a heat-responsive means including an expansible bellows mounted in said housing to co-act with said lever, an exposure bulb connected by a flexible tube to said bellows, and a gaseous fluid confined therein, said fluid expanding said bellows as the temperature of the bulb rises to disengage said locking means and allow rotation of said reel to unwind said connected chain and lower said draft door at a predetermined temperature.

5. As an article of manufacture for use with a furnace having a draft door that normally tends to close, a draft door chain lengthening safety device, comprising: a housing, a windlass mounted in said housing, a flexible member connected to said windlass at one end and to the draft door at the other end, key means for winding said member on said windlass thereby to open said door, a ratchet and lever means to lock said windlass against unwinding rotation, heat-responsive means to unlock said locking means at a predetermined temperature to permit said member to unwind and said door to close, and a hook-like means for connecting said device in the draft door chain as a link thereof.

6. As an article of manufacture for use with a furnace having a draft door which normally tends to close and which is controlled by a chain, a chain lengthening safety device, comprising: a housing, a shaft rotatably mounted in said housing, a chain-carrying reel mounted on said shaft, a ratchet mounted on said shaft, a lever means mounted on said housing and movably engaging said ratchet to lock said shaft against unwinding rotation, spring means for maintaining said lever in engagement with said ratchet, a lever-shifting means to disengage said lever to allow rotation

of said shaft and reel to lengthen said control chain, said means including: an expansible bellows mounted in said housing with one end engaging said lever, a flexible tube connecting said bellows to a pressure bulb mounted in the stack of said furnace, and a gaseous fluid confined in said bellows, tubing and bulb to expand said bellows when heated to a certain temperature and thereby shift said lever.

7. An article of manufacture for use with a furnace having the usual chain-controlled draft door, a safety device comprising: a housing, a hook means for carrying said housing by the draft control chain, a reel rotatably mounted in said housing, a flexible member attached to said reel and to said draft door, key means for winding said member upon the reel, a ratchet mounted in said housing and connected to said reel, lever means pivotally mounted to said housing and engaging said ratchet at one end, spring means carried by said housing holding said lever in engagement with said ratchet and lock said reel against unwinding rotation, an expansible bellows means engaging the free end of said lever for shifting said lever out of engagement with said ratchet and permit rotation thereof to lengthen said draft door chain, and means to expand said bellows at a predetermined temperature, including an exposure bulb connected to said bellows by a flexible tube, and a volatile fluid sealed within said bulb, tubing and bellows.

HAROLD HOPTON.

LAWRENCE T. WAHLSTROM.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
700,003	Anderson	May 13, 1902
777,926	Stevens	Dec. 20, 1904
1,966,724	Kimball	July 17, 1934
2,055,426	Celander	Sept. 22, 1936