

April 2, 1946.

C. H. MORROW

2,397,879

DRAFT REGULATOR

Filed Jan. 4, 1945

2 Sheets-Sheet 1

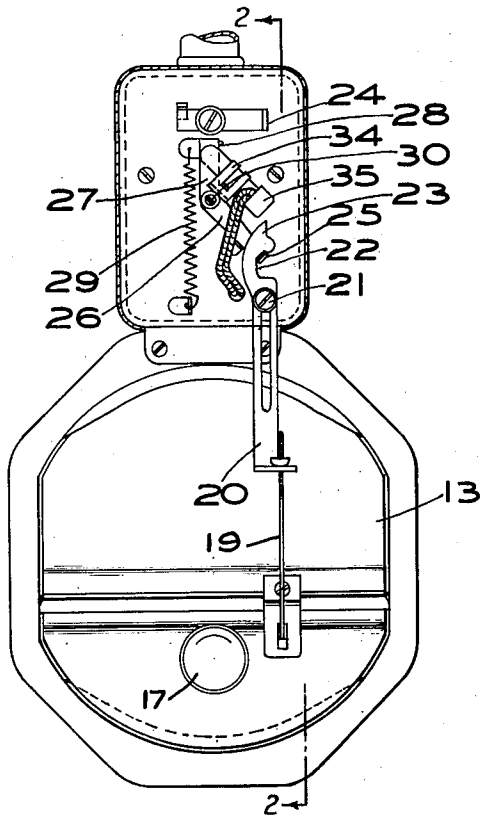


Fig. 1

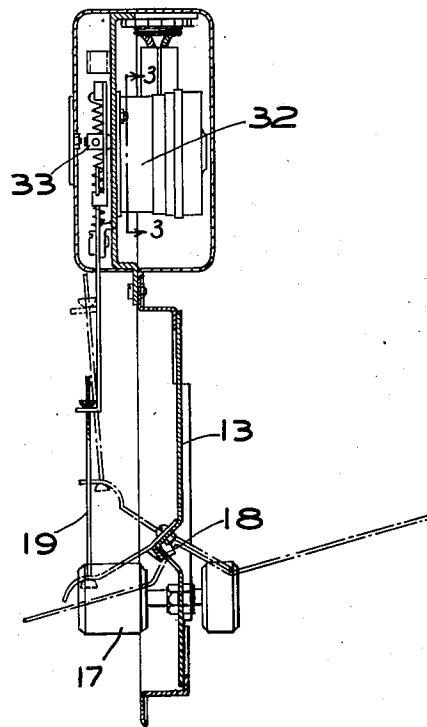


Fig. 2

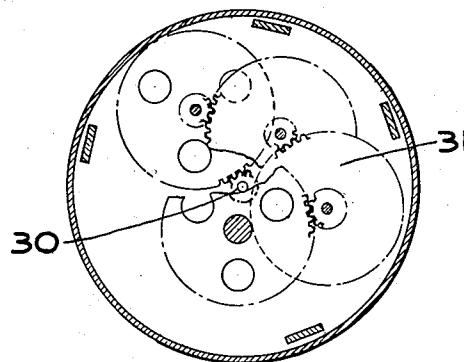


Fig. 3

INVENTOR.
CLARENCE H. MORROW
BY *Hyde and Meyer*

ATTYS.

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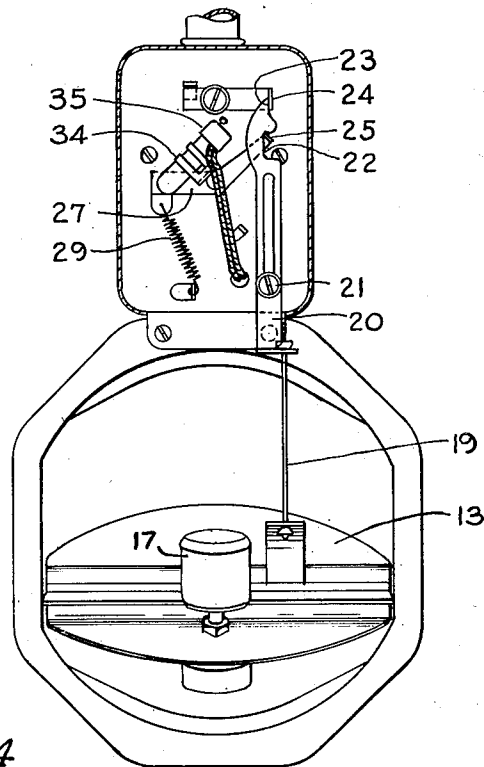


Fig. 4

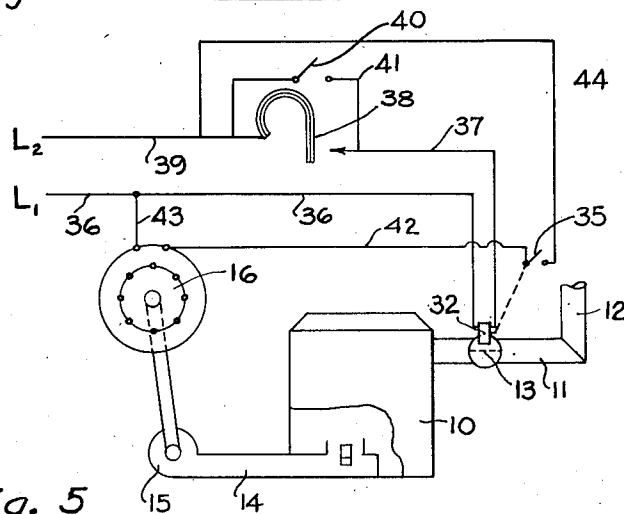


Fig. 5

INVENTOR.
CLARENCE H. MORROW

BY *Hyde and Meyer*

ATTYS.

UNITED STATES PATENT OFFICE

2,397,879

DRAFT REGULATOR

Clarence H. Morrow, Shaker Heights, Ohio, assignor to The Hotstream Heater Company, Cleveland, Ohio, a corporation of Ohio

Application January 4, 1945, Serial No. 571,238

3 Claims. (Cl. 236—1)

This invention relates to control devices for furnace draft regulators.

One object of the invention is to provide improved control mechanism in which upon a call for more heat the required increase in the fuel combustion rate is delayed for a period which though short is long enough to make certain that the draft opening has actually been fully closed, thus reducing or preventing any possibility of ejecting smoke or fumes into the room in which the furnace is located.

Still another object is to provide improved control mechanism of this kind in which the room thermostat itself directly controls but one regulating motor, to-wit, that which operates or controls the draft regulating damper, but which motor also serves as a relay to produce subsequent delayed operation of the air or fuel feeding device for the purpose of meeting the demand for change in the rate of heat supply.

Further objects of the invention in part are obvious and in part will appear more in detail hereinafter.

In the drawings, which represent one suitable embodiment of the invention,

Fig. 1 is a front elevation showing the regulating damper in closed or release position;

Fig. 2 is a sectional elevation on approximately the line 2—2, Fig. 1, the dotted lines illustrating certain of the parts in damper-open or stand-by position;

Fig. 3 is a detail sectional view, on the line 3—3, Fig. 2;

Fig. 4 is a view, corresponding to Fig. 1 and illustrating the damper in damper-open or stand-by position; and

Fig. 5 is a diagram, illustrating the control circuits.

The invention is an improvement upon that described and claimed in a prior patent to Morris W. Crew, and George A. Short, No. 2,381,437 for Control means for draft regulators, granted August 7, 1945, to which reference may be had if desirable or necessary.

Referring to the drawings attached hereto, 10 represents any furnace or equivalent fuel burning device to which the invention may be applied. Said furnace is equipped with a smoke conduit 11 leading to the stack pipe 12 and provided with a draft regulating damper 13 located in a lateral pipe connection, as is usual. 14 indicates a pipe or conduit for supplying to the combustion chamber, from a feeding device 15, additional material for increasing the rate of heat production. If the additional material is

air, or liquid or gaseous fuel, or a mixture of fuel and air, the feeding device 15 is an injector, fan or blower, but if solid fuel is employed said device will be any suitable stoker mechanism, whose rate of operation is increased or reduced in step with variations in the demand for heat, as is usual. In my case, the feeding device is driven by a suitable electric motor 16.

Draft damper 13 and its operating mechanism are of the same general form and arrangement shown in said prior referred to. The damper is provided with an adjustable counterweight 17 and is pivoted at 18. It is connected by a wire link 19 to the lower end of a latch member 20 pivoted and sliding upon a screw 21 and provided at its upper end with a recess 22 and a latch lip 23, the latter cooperating with a fixed shoulder or abutment 24 and the former with a lateral projection 25 on one arm 26 of a two-armed lever, the other arm 27 of which cooperates with a stop pin 28 and has attached thereto one end of a biasing tension spring 29.

Said lever is mounted upon and is driven by the final slow running shaft 30 of speed reducing gearing, marked generally 31, shown in Fig. 3, and operated by a suitable synchronous clock motor marked generally 32. On the hub 33 of the two-armed lever is mounted a clip 34 in which is supported a suitable mercoid switch 35, to be later referred to.

Referring to Fig. 4, the clock motor 32 is connected on one side by conductor 36 to L1 and on the other side by conductor 37, thermostatic switch 38 and conductor 39 to L2. Thermostatic switch 38 is located in and is sensitive to variations in the temperature in the room or place to be heated.

40 represents a manual normally open switch, in a shunt circuit 41 around switch 38, by means of which the control system may be operated manually when desired.

Mercoid switch 35, normally open, is connected on one side by conductor 42 to motor 16, and thence by conductors 43, 36 to L1. On the other side switch 35 is connected by conductors 44, 39 to L2.

The operation is as follows:

Fig. 4 represents the stand-by position of the parts, when the rate of combustion and of heat production is low or at a minimum. The feeding device 15 is either operating at low speed or is idle and inoperative, as shown, because switch 35 is open. The draft damper is held fully open and room air therefore enters the draft opening

and flows directly to the stack, avoiding withdrawal of hot gases from the combustion chamber to the stack and the loss of the heat contained therein.

When the temperature in the space being heated, as at the thermostat 38, drops below the critical value, there is a call for more heat, whereupon thermostatic switch 38 closes, immediately completing the circuit through the clock motor 32, which starts to rotate and to turn the shaft 30 and the two-armed lever 26, 27 connected thereto in the clockwise direction, Fig. 4, and move it, at slow speed, to the position shown in Fig. 1, where it is stopped by stop pin 28.

As in the prior patent referred to the early increments of motion of the two-armed lever promptly release the latch member 20 from the projection 25 of the two-armed lever, permitting said latch member to drop promptly to the position shown in Fig. 1, under the influence of the gravity effect of the parts, including counterweight 17, so that the draft damper immediately closes. But in the present construction, operation of the fuel motor 16 does not begin simultaneously with operation of the damper motor, but at a later time, when it is certain that the damper actually has closed.

The speed reducing gearing 31 so reduces the rate of rotation of the parts that shaft 30 rotates at the rate of one revolution per minute or even slower, so that it takes approximately ten seconds or so for the mercoild switch 35 to move sufficiently for the mercury therein to move to the other end of the tube and close the switch. This switch closing effect is consummated when the mercoild tube has moved clockwise in Fig. 4 to a position a little beyond the horizontal. When switch 35 closes the circuit to the motor 16 is completed, whereupon the feeding device 15 is either operated at a higher rate of speed or begins operation, according to the system employed. In either case the rate of combustion and of the production of heat is increased in accordance with the demand, but the increase has been delayed pending closing with certainty of the damper, so that no fumes or smoke are ejected into the open room.

Motor 32 is of such character as to enable it to remain energized and stalled indefinitely, without injury as the result of possible rise in temperature of the motor parts. When the demand for heat has been satisfied, thermostatic switch 38 opens, thereby promptly deenergizing motor 32. Thereupon spring 29 becomes effective to rotate the two-armed lever and shaft 30 in the reverse direction, but at slow speed on account of the retarding effect of the speed reducing gearing. During return motion of the lever the draft damper is moved to the open position shown in Fig. 4, and mercoild switch 35 is returned to its original open position, cutting off the flow of current to motor 16, which stops. Consequently the feeding device 15 stops and the rate of combustion and of heat production is reduced to its original value. The parts remain in the position shown in Fig. 4 until another cycle of operations is required to be performed.

Of course, when the damper and other parts are in the positions shown in Fig. 1, said damper, on account of its loose connection to the link 19, is free to open and close and compensate for variations in stack draft and thereby maintains uniform the relative proportions of air and fuel in the combustion chamber.

The arrangement described makes it possible to so assemble, arrange or adjust the parts that in

the position shown in Fig. 4 the latch lip 23 materially overlaps the abutment 24, even as much as will require two to three seconds to disengage them when heat is called for, and avoiding any necessity of a delicate hair trigger setting, as will be readily understood.

Other advantages of the invention will be apparent to those skilled in the art.

What I claim is:

1. In combination with a furnace, control apparatus therefor, including a feeder communicating with the furnace combustion chamber and adapted by its operation to cause such furnace actuation as will satisfy a demand for more heat, an operating motor therefor, a draft damper for said furnace, an operator therefor movable alternately to stand-by and damper release positions, motor means for actuating said operator, thermostatic means sensitive to variations in temperature in the space heated by said furnace and operative upon a demand for more heat to cause actuation of said motor means in a manner to move the operator from stand-by to damper release position, means rendered effective by said operator during an early stage of its said movement for causing movement of said damper to release position, and means rendered effective by said operator during a later stage of its said movement for causing operation of said operating motor and feeder to thereby cause such furnace operation as will satisfy the said demand.

2. In combination with a furnace, control apparatus therefor, including a feeder communicating with the furnace combustion chamber and adapted by its operation to cause such furnace actuation as will satisfy a demand for more heat, an operating motor therefor, a draft damper for said furnace, an operator therefor movable alternately to stand-by and damper release positions, motor means for actuating said operator, thermostatic means sensitive to variations in temperature in the space heated by said furnace and operative upon a demand for more heat to cause actuation of said motor means in a manner to move the operator from stand-by to damper release position, disconnectible operating means connecting said operator and damper and arranged when disconnected to release the damper for prompt free motion to release position, means rendered effective by said operator during an early stage of its motion from stand-by to damper release position for so disconnecting said operating means, and means rendered effective by said operator during a later stage of its said motion for causing operation of said operating motor and feeder to thereby cause such furnace operation as will satisfy the said demand.

3. In combination with a furnace having a stack pipe provided with a lateral opening and a pivoted damper for controlling said opening, control apparatus including a feeder communicating with the furnace combustion chamber and adapted by its operation to cause such furnace actuation as will satisfy a demand for more heat, an operating motor therefor, a damper operator movable alternately to stand-by and damper release positions, motor means for actuating said operator, thermostatic means sensitive to variations in the temperature in the space heated by the furnace and operative upon a demand for more heat to cause operation of said motor means in a manner to move the operator from stand-by to damper release position, a latch slide having a disconnectible

connection to said operator and a loose connection to said damper and arranged when disconnected to release the damper for prompt free motion to release position and for free swinging motion relative to said latch slide to accommodate 5 itself to variations in stack draft, means rendered effective by said operator during an early stage of its motion from stand-by to damper release

position for so disconnecting said latch slide from said operator, and means rendered effective by said operator at a later stage of its said motion for causing operation of said operating motor and feeder to thereby cause such furnace operation as will satisfy said demand.

CLARENCE H. MORROW.