Dec. 8, 1931. A. D. SHILAND 1,835,907

AUTOMATIC DAMPER CONTROL

Filed May 11, 1931 2 Sheets-Sheet 1

Fig. 1.

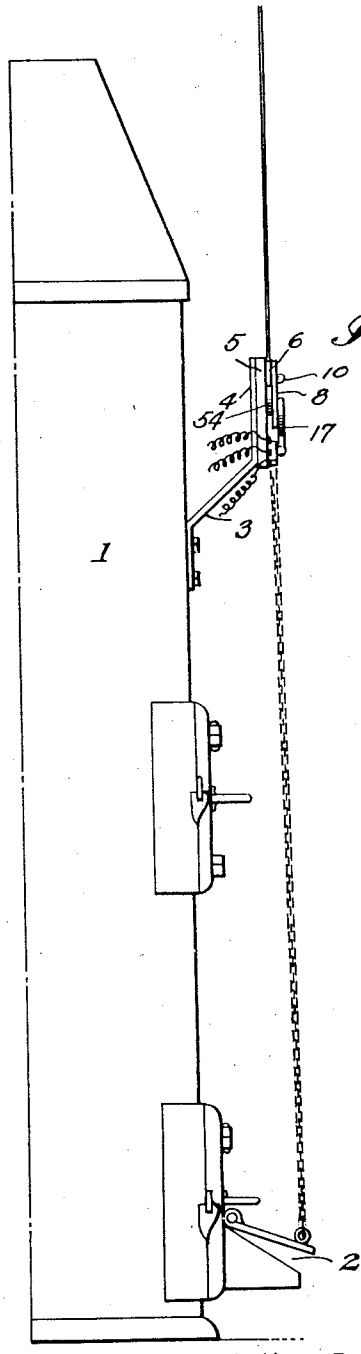


Fig. 3.

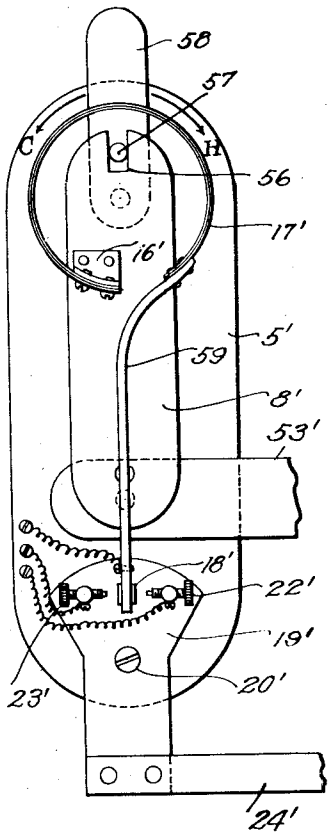
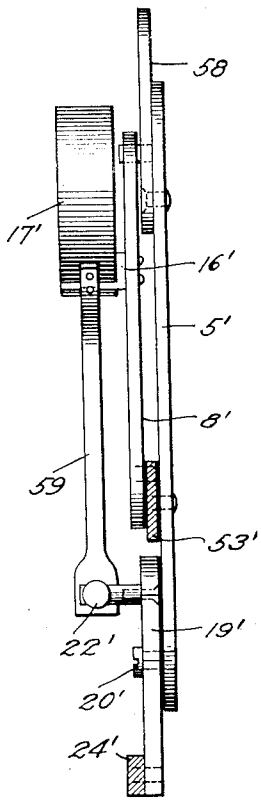


Fig. 4.



Arthur D. Shiland INVENTOR

BY Victor J. Evans and

ATTORNEYS

Dec. 8, 1931. A. D. SHILAND 1,835,907

AUTOMATIC DAMPER CONTROL

Filed May 11, 1931 2 Sheets-Sheet 2

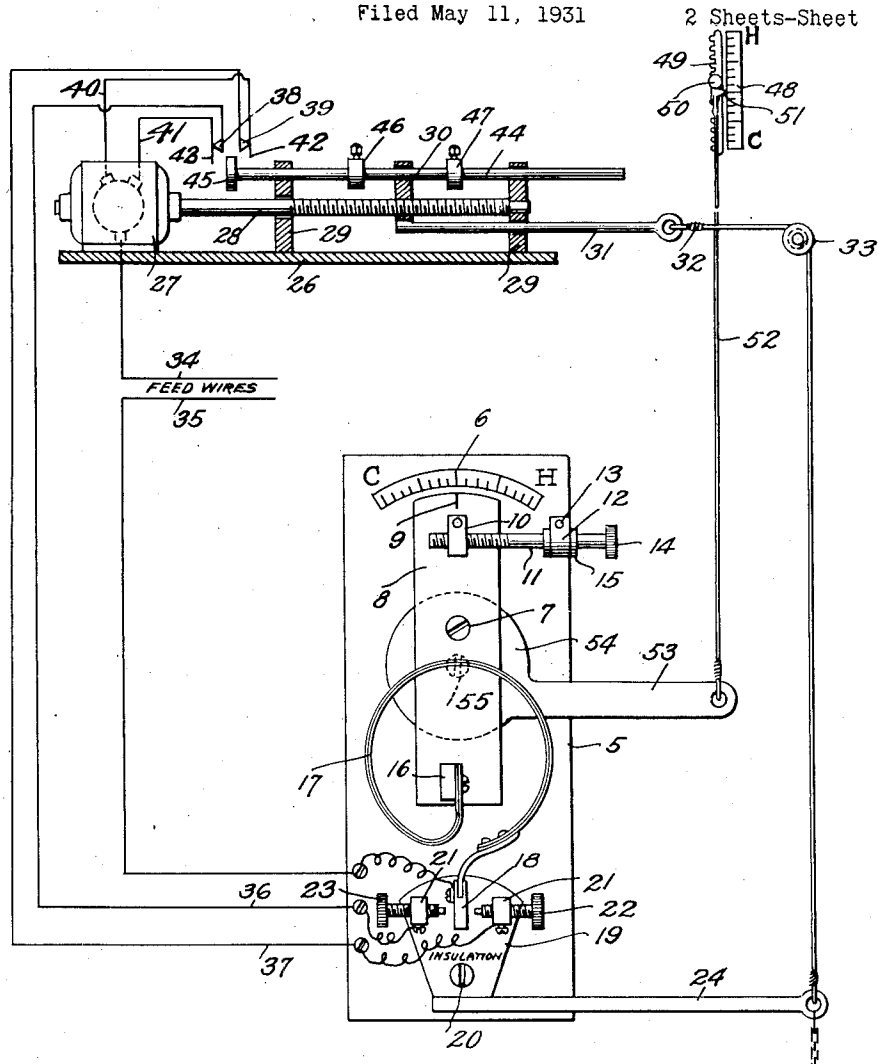


Fig. 2.

Arthur D. Shiland INVENTOR

BY Victor J. Evans and Co. ATTORNEYS

Patented Dec. 8, 1931

1,835,907

UNITED STATES PATENT OFFICE

ARTHUR D. SHILAND, OF CLEVELAND, OHIO

AUTOMATIC DAMPER CONTROL

Application filed May 11, 1931. Serial No. 536,537.

The object of this, my present invention, is to provide an electrically controlled automatic draft regulator that will open and close draft doors on a furnace by steps instead of opening doors wide or shutting them tight. The advantage of this invention is that the draft doors are automatically brought to the exact position required to give the proper draft to keep fire burning at a predetermined intensity as shown and controlled on a scale. This is a decided advantage over the up and down condition of a fire as sometimes regulated.

Also by certain mechanical changes this invention can be made to operate on changes in pressure of air, gas, water, etc., and made to control a valve, a speed regulator on a motor, etc.

The invention will be fully and comprehensively understood from a consideration of the following detailed description when read in connection with the accompanying drawings which form part of the application, with the understanding, however, that the improvement is capable of extended application and is not confined to the exact showing of the drawings nor to the precise construction described and, therefore, such changes and modifications may be made therefrom as do not affect the spirit of the invention nor exceed the scope thereof as expressed in the appended claims.

In the drawings:

Figure 1 shows the installation of the improvement on a furnace to control front draft door only. Other dampers on furnace can be operated at same time if required, by proper use of chain and pulleys.

Figure 2 shows invention installed to operate draft on a furnace.

Figure 3 is a face view of a slightly modified form of the thermostatic means.

Figure 4 is a side elevation thereof with parts in section.

In the drawings the numeral 1 designates a furnace, and 2 the cold air inlet duct arranged below the grate and communicating with the ash pit of the furnace.

Either in or in close proximity to the front of the furnace 1 I fix an upstanding bracket 3. The bracket has an outer vertical arm 4 to which is fixed a body member in the nature of a plate 5. The plate 5, on its outer face has at its top a heat degree scale 6 and on the outer face of the plate 5 below the scale 6 there is arranged a flat arm 8. The bracket and the plate 5 provide a frame and will be hereinafter referred to as such. The plate 8 has on its outer face an indicator mark 9 to register with any of the degree marks on the arched scale 6. Below the indicator mark 9 there is fixed on the arm 8 a bearing nut 10 that has screwed therethrough a bolt 11. The bolt passes through a bearing 12 that is secured on the outer face of the frame by a bolt or screw 13. The outer and non-threaded end of the bolt is headed, as at 14, and the bolt has fixed thereon spaced enlargements in the nature of stop elements 15 to contact with the opposite sides of the bearing 12 and thereby prevent the longitudinal movement of the bolt. The bolt may be adjusted to bring the degree mark 9 opposite any one of the degree marks on the scale 6.

Having one of its ends secured to an insulating block 16 on the lower face of the arm 8 there is one end of an arched laminated spring 17. The spring 17 is in the nature of a thermostatic member and the second and lower end thereof is fixed in a contact lug 18 that extends downwardly and over the outer face of the segmental plate or member 19 of insulating material. The member 19 is pivotally secured, as at 20, to the frame. At the opposite sides of the contact lug 18 there are fixed on the segmental plate 19 other lugs 21 which have threaded openings therethrough for the reception of the shanks of headed screws 22 and 23, respectively, and the said screws are also in the nature of contacts. Fixed to and extending laterally from the lower end of the segmental member 19 there is an arm 24 which has an outer eye end to which is attached one of the end links of a chain or like flexible element 25 which is also attached to the hinged damper 2 of the furnace 1.

The numeral 26 designates a shelf that may be arranged in close proximity to the furnace 1. This shelf affords a support for

an electric motor 27. The motor is of the series type and, therefore, is reversible in operation. The shaft 28 of the motor, in this instance, comprises an elongated member that is guided in upstanding spaced bearings 29 supported on the shelf 26. The portion of the shaft between the bearings 29 is threaded and the said threaded portion is screwed through a threaded opening in an upstanding arm 30 formed on the inner end of a longitudinally extending rod 31 that passes through a bearing opening in the outer bearing 29. The outer end of the rod is formed with an eye to which is attached one end of a cable 32, the said cable being trained over a grooved wheel 33 and is directed downwardly and has it second end secured to the eye on the end of the arm 24.

Wires connected to the house current are indicated in Figure 2 by the numerals 34 and 35, respectively, the wire 34 leading to the armature in the motor and the wire 35 is directed toward and is connected to the contact 18. The metal lugs 21 have connected thereto conductor wires 36 and 37, respectively, and these wires are directed upwardly over the shelf 26 between the motor 27 and the inner bearing 29 and terminate in fixed contacts 38 and 39, respectively. Wires 40 and 41 lead from the fields of the motor and merge into spring switches or contacts 42 and 43, respectively, the said spring contacts being normally in engagement with the outer faces of the fixed contacts 38 and 39, respectively. The offset end 30 of the rod 31 has a non-threaded opening therethrough for the passage of a rod 44 whose inner end is headed, as at 45, and the said head is arranged between the spring contact members 42 and 43. Adjustably fixed on the rod 44 there are spaced stop members 46 and 47, respectively, the same being arranged in the opposite sides of the offset end or arm 30 of the rod 31. The rods 31 and 44 comprise the circuit breaker of the improvement and the circuit breaker is operated by the turning of the shaft 28 of the motor 27.

The operator adjusts the bolt or screw 11 to bring the mark 9 on the plate 8 opposite any one of the degree marks on the scale 6 to accord with the heat temperature desired in the house. This adjustment changes the relative position of the bi-metal spring 17 and the contact 18 thereon with respect to the contacts 22 and 23. As the fire in the furnace dies down and the laminated thermostatic spring 17 is permitted to cool, the spring will contract and will swing the member 18 against the screw contact 23. This will cause the operation of the motor to be started and which, through the medium of its screw shaft, will impart a longitudinal movement of the rod 31 in the direction of the motor, thus drawing the cable 32 to cause the same to break contact between 18 and 23, stopping motor and together with the chain 25 to open the draft door 2 to a slight degree so that the fire in the furnace will be increased. However, if the furnace gets colder and more draft is needed the same operation is repeated until the draft 2 is wide open and the turning of the motor shaft will bring the arm or offset end of the rod 31 against the contact 46, thereby imparting longitudinal movement to the rod 44 to cause the head 45 thereof to engage with the spring switch or contact 43, breaking the circuit and stopping the motor. The pull upon the cable 32 and the chain 25 is not sufficient to swing the segment 19 to bring the contact 18 into engagement with the contact screw 22, but when the combustion in the furnace increases to a degree that will cause the thermostatic laminated spring 17 to expand the contact 18 is brought against the contact screw 22 and the damper drops a trifle which swings the segmental member 19 to bring the contact screw 22 away from the contact 18 so that the motor will be stopped. When the contact 18 engages with the contact screw 22 the motor is operated in a reverse direction to that previously described which causes the screw shaft 28 to move the rod 31 to bring its offset end or arm 30 against the stop 47 and to further move the rod 44 to cause the head 45 to engage with the spring contact 42 and to bring the same away from the fixed contact 39 which, of course, breaks the circuit and stops the motor. Thus it will be seen that the device is entirely automatic in operation.

The heat may be regulated by a remote control. The control includes a heat degree scale 48, a rack 49 to one side on the outer face thereof, a headed element 50 having a stem to be received between the teeth of the rack and carrying an indicator finger 51 to be disposed opposite any of the degree marks on the scale 48. The finger has attached thereto a cable 52 and this cable is connected to an arm 53 that extends from a headed member 54. The member 54 is round in plan and is pivoted, as at 55, to the plate 5 and is also pivoted to the arms 8, as at 7. The bearing 10 holds the upper end of the arm 8 steady so that movement of the pivot point 7 will, at the same time, move the lower portion of arm 8 and also the contact 18. Thus should 10 be moved, say one-fourth inch to the left, by means of the bolt 11, and the point 7 moved to the left ¼ inch by means of the arm 53, then the whole arm 8 will be in a position one-fourth inch to the left of its first position and the contact 18 will also be one-fourth inch to the left of its original position. After the device is adjusted the operation of the control arm 53 takes care of any changes that may be required.

The insulated segment 19 is controlled in its swinging movement by the arm 24 which is in turn controlled by the cable 32 con-

nected with the rod 31 of the circuit breaker.

In Figures 3 and 4 the plate 5′ has its upper edge rounded and is provided on its outer face with a heat degree scale. The plate 8′ is pivotally secured on the plate 5′ in the same manner as the plate 8 is secured to the plate 5, and to the lower end of the plate 8′ there is connected the arm 53′ similar to the arm 53. The plate 8′ has its upper edge notched, as at 56, and received in this notch there is a pin 57 carried by a cutter arm or finger 58 that is pivotally secured to the plate 5′. To the outer face and adjacent to the upper end of the plate 8′ there is fixed an insulating block 16′ on whose outer and angle end there is secured an arched laminated spring 17′. The thermostatic spring 17′ has attached to its free end the upper and rounded portion of a depending arm 59 that carries a contact lug 18′ movable between the adjustable contacts 22′ and 23′ on the segmental plate 19′. The segmental plate 19′ is pivoted, as at 20′, to the plate 5′ and carries on its lower end the arm 24′. The parts just described are practically similar and for the same purpose as those previously described.

Having described the invention, I claim:

1. In an automatic damper control, a reversible electric motor wired to a source of electricity, a circuit breaker, a rod movable longitudinally by the motor and operable in such movement to move the circuit breaker when the rod has nearly reached the limit of its longitudinal movement in two directions, a pair of fixed contacts wired to the fields of the motor, movable switches in the path of engagement with the circuit breaker engaging such contacts, a pivoted segment having adjustable contacts thereon wired respectively to the switches, an arm extending from the segment, a flexible element connected to the damper of a furnace and to the arm of the rod, guide means for the flexible element, a thermostatic spring having one end fixed and its other end provided with a contact which is arranged between the adjustable contacts and the segment and said spring contact and wire being wired to the contacts on the segment.

2. In an automatic damper control, a reversible electric motor wired to a source of electricity, a circuit breaker, a rod movable longitudinally by the motor and operable in such movement to move the circuit breaker when the rod has nearly reached the limit of its longitudinal movement in two directions, a pair of fixed contacts wired to the fields of the motor, movable switches in the path of engagement with the circuit breaker engaging such contacts, a pivoted segment having adjustable contacts thereon wired respectively to the switches, an arm extending from the segment, a flexible element connected to the damper of a furnace and to the arm of the rod, guide means for the flexible element, a thermostatic spring having one end fixed and its other end provided with a contact, which is arranged between the adjustable contacts on the segment and said spring contact and wire being wired to the return wire of the circuit, a swingable plate on which the fixed end of the thermostatic spring is secured, and adjustable means for swinging and holding the plate at determined angles.

3. In an automatic damper control, a reversible electric motor wired to a source of electricity, a circuit breaker, a rod movable longitudinally by the motor and operable in such movement to move the circuit breaker when the rod has nearly reached the limit of its longitudinal movement in two directions, a pair of fixed contacts wired to the fields of the motor, movable switches in the path of engagement with the circuit breaker engaging such contacts, a pivoted segment having adjustable contacts thereon wired respectively to the switches, an arm extending from the segment, a flexible element connected to the damper of a furnace and to the arm of the rod, guide means for the flexible element, a thermostatic spring having one end fixed and its other end provided with a contact which is arranged between the adjustable contacts on the segment and said spring contact and wire being wired to the return wire of the circuit, a swingable plate on which the fixed end of the thermostatic spring is secured, said plate being of insulating material and having an indicating mark thereon, a heat degree scale opposite the indicator mark, and adjustable means for swinging the plate to bring the mark thereon opposite any of the heat degree scale marks.

4. In an automatic damper control, a reversible electric motor wired to a source of electricity, a circuit breaker, a rod movable longitudinally by the motor and operable in such movement to move the circuit breaker when the rod has nearly reached the limit of its longitudinal movement in two directions, a pair of fixed contacts wired to the fields of the motor, movable switches in the path of engagement with the circuit breaker engaging such contacts, a pivoted segment having adjustable contacts thereon wired respectively to the switches, an arm extending from the segment, a flexible element connected to the damper of a furnace and to the arm of the rod, guide means for the flexible element, a thermostatic spring having one end fixed and its other end provided with a contact which is arranged between the adjustable contacts on the segment and said spring contact and wire being wired to the return wire of the circuit, a swingable plate on which the fixed end of the thermostatic spring is secured, and adjustable means for swinging and holding the plate at determined angles, said means including an arm fixed on the plate, a degree scale, a mark opposite the scale and a pointer

element directed toward the scale, an operating handle for the pointer element having a part engageable with the rack and a flexible connection between the pointer element and the arm.

5. A reversible electric motor having a field wire connected thereto, a screw shaft operated by the motor, bearings for the shaft, a rod having an angle end threadedly engaged by the shaft, a headed member movable through the bearings and likewise movable through the angle end of the rod, adjustable stop elements on the member and said headed member comprising a circuit breaker, fixed contacts wired to the fields of the motor, oppositely disposed swingable switches engaging the contacts and said switches being in the path of engagement with the head of the circuit breaker, when the latter is moved by the rod in either of two directions, a pivotally supported segmental plate of insulating material, adjustable contacts thereon wired to the respective switch members, an arm extending from the segment, a pivotally supported plate of insulating material, a coiled thermostatic spring having one end fixed to the plate and its second end provided with a contact which is arranged between the adjustable contacts on the segment and the spring contact being connected to the feed wire, said plate having a mark on the upper end thereof, a heat degree scale opposite the said end of the plate, a means located adjacent to the plate or located remote from the plate for swinging the plate to arrange the mark thereon opposite any of the marks on the heat scale, flexible elements connected to the rod, the arm and to the draft door of a furnace and guides for said elements.

In testimony whereof I affix my signature.

ARTHUR D. SHILAND.