W. A. LACKE.

DAMPER REGULATOR.

APPLICATION FILED FEB. 23, 1917.

1,284,715.

Patented Nov. 12, 1918.

2 SHEETS—SHEET 1.

Fig. 1

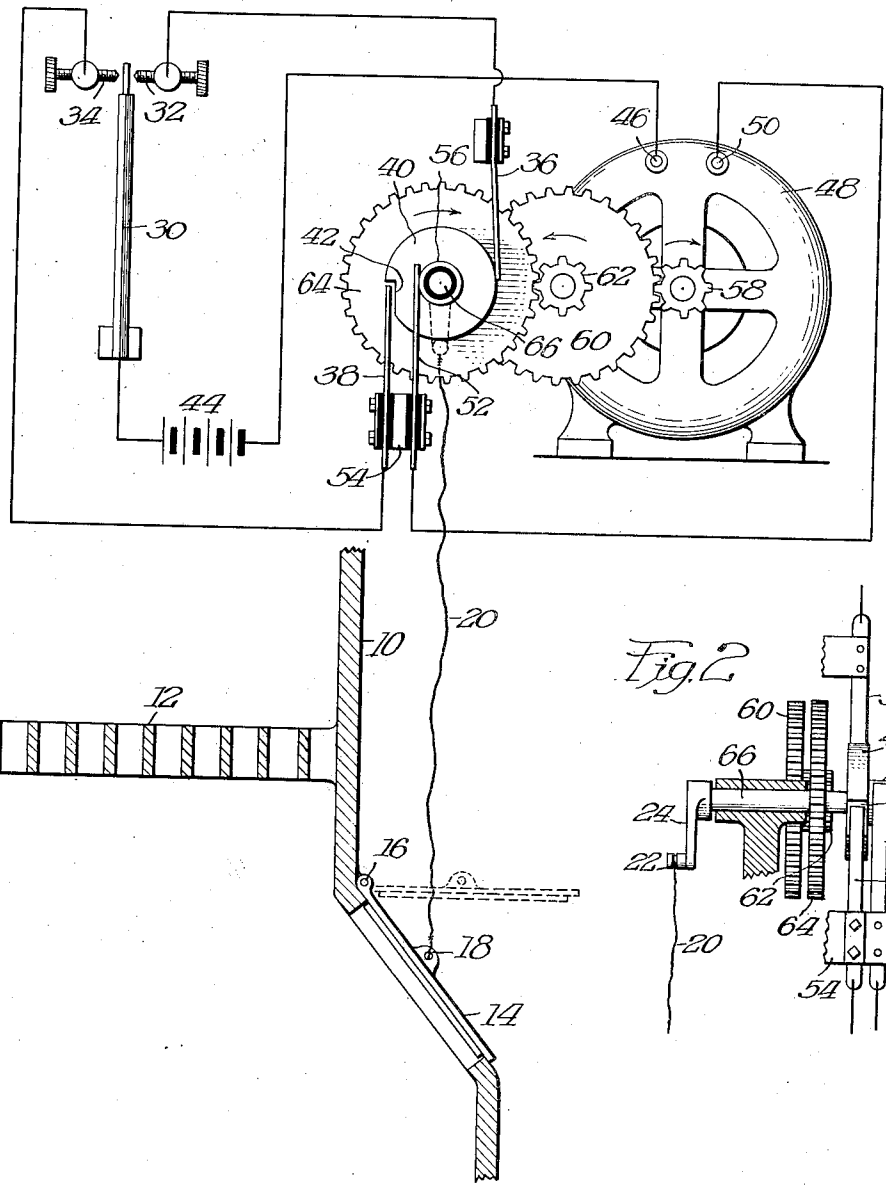


Fig. 2




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Fig. 3

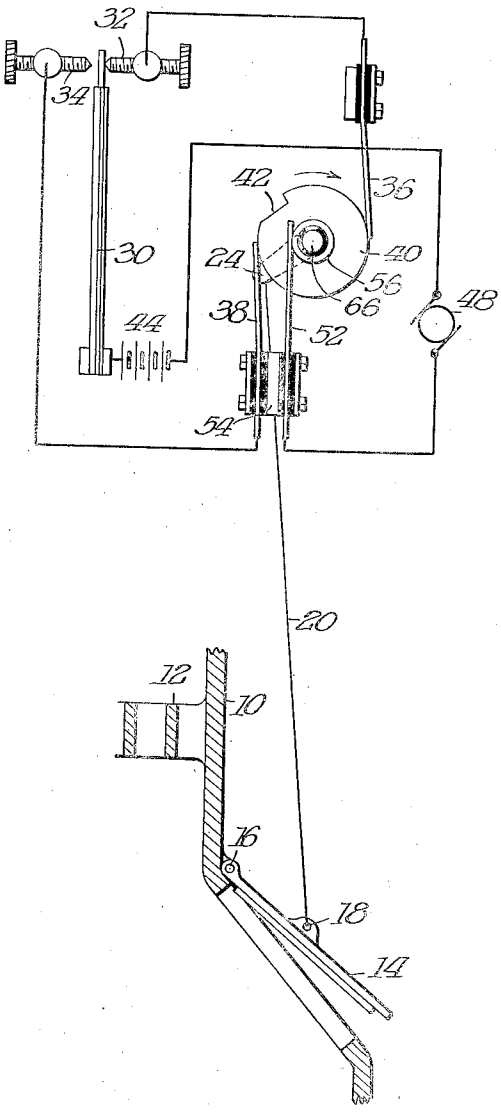
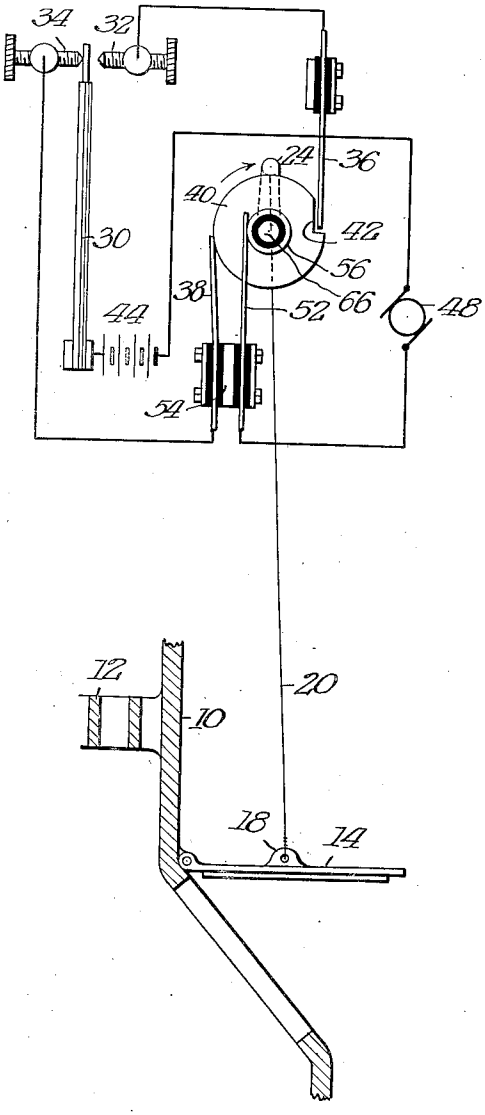



Fig. 4

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# UNITED STATES PATENT OFFICE.

WILLIAM A. LACKE, OF CHICAGO, ILLINOIS.

## DAMPER-REGULATOR.

1,284,715. Specification of Letters Patent. Patented Nov. 12, 1918.

Application filed February 23, 1917. Serial No. 150,335.

*To all whom it may concern:*

Be it known that I, WILLIAM A. LACKE, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Damper-Regulators, of which the following is a specification.

This invention relates to damper regulators, and particularly to thermostatically controlled electric motor devices for opening and closing the damper of a furnace, or the like, in order to regulate the heat supplied by such heating device.

The object of the invention is to so arrange and connect the various parts that accidental or malicious partial operation of the thermostat cannot throw the entire mechanism out of order, as has heretofore been possible with resulting excessive heating and possible fire damage.

The invention consists in a device capable of carrying out the foregoing objects; which can be very easily and cheaply made and installed; which is entirely satisfactory in operation, and not readily liable to get out of order. It further consists in the features and details of construction hereafter more fully set forth in the specification and claims.

Referring to the drawings, in which similar numerals indicate the same parts throughout the several views,

Figure 1 is a general view showing mechanism illustrating this invention in its preferred form, the furnace damper being closed.

Fig. 2 is a side view partially in section showing the commutator devices and other adjacent details.

Fig. 3 is a changed position view of the parts of Fig. 1, showing the position of the parts when the furnace damper has just begun to open.

Fig. 4 is another changed position view showing the furnace damper fully open, this being the extreme changed position view from that of Fig. 1.

Referring particularly to Fig. 1, in which the entire mechanism is illustrated, a conventional form of furnace 10 with grate bar 12 and damper door 14, hinged at 16, so as to operate in one direction by gravity, is shown. This damper door has connected to it at any suitable point, as 18, an initially loose or slack cord or chain 20, whose opposite end is connected at 22 to the crank 24 of suitable operating mechanism, adapted, when properly energized, to move in a circle from the position of Fig. 1 through the position of Fig. 3 to that of Fig. 4, in which the damper door is wide open and thence on to the return position shown in Fig. 1, from which it started.

In order to properly operate and control the crank arm 24 under all working conditions, some sort of mechanism, such as that shown in the upper half of Fig. 1, is provided, the same including a thermostatic element 30 adapted to move into engagement with contact 32 when the room controlled by the device is cold and more heat is wanted, and to move into engagement with contact 24 when the room is too warm and it is desired to improve this condition by partially or wholly shutting off the heat at the furnace. Contact 32 is electrically connected with a commutator brush 36, while contact 34 is electrically connected with a commutator brush 38, and these brushes are oppositely disposed on the circumferential surface of a commutator wheel 40, provided at one point with a notch 42 of such a size, shape and location with reference to the commutator brushes that when the parts are in and near the position of Fig. 1, brush 38 does not contact the surface of commutator 40. Similarly, when the parts are in the position of Fig. 4, brush 36 avoids contact with the commutator.

The thermostat 30 is connected at its opposite end from the contacts 32 and 34 with the battery 44 which is in turn electrically connected to one terminal 46 of an electric motor 48. The opposite terminal 50 is electrically connected to a commutator brush 52, insulated from brush 38 at 54 and bearing upon a commutator hub 56 in electrical communication with commutator wheel 40.

The electric motor 48, heretofore described, through suitable gearing, as for instance pinion 58, gear 60, pinion 62 and gear 64, drives commutator shaft 66, upon which the commutator 40 and hub 56 are mounted. On viewing the parts shown in Fig. 1 it will be readily seen that whenever the room controlled by thermostat 30 is too cool and the thermostatic bar moves to engage contact 32, electric current will pass from battery 44, through thermostat 30, contact 32, commutator brush 36 to commutator 40, thence through hub 56, and brush 52 to terminal 50 of motor 48, thus starting the motor from which said current returns through

terminal 46 to battery 44. The motor being started, shaft 66 and consequently crank 24 is rotated in a clockwise direction, as viewed in Fig. 1, with the result that the parts move through the position of Fig. 3 to that of Fig. 4 when commutator brush 36 passes into notch 42, as shown in Fig. 4, thus breaking the battery current and stopping the motor 48. This leaves damper door 14 at its most wide open position, as shown in Fig. 4, thus allowing all air possible to go to the furnace and heat to be supposedly rapidly generated.

When, as a result of this fresh supply of heat from the furnace, the room becomes too hot, thermostatic bar 30 swings to the left, as viewed in the figures, into engagement with contact 34, thus completing the circuit from the battery through the motor and commutator brush 38, in the obvious manner, thus starting the motor and rotating shaft 66 farther in a clockwise direction until the parts return to the position of Fig. 1, in which position brush 38 does not contact commutator 40, consequently breaking the battery circuit and stopping motor 48, thereby leaving the mechanism at rest with the damper 14 closed and the furnace checked as much as possible.

It is important to notice that the cord or chain 20 is not tight when the damper is closed, and that it does not become sufficiently tight to begin to lift the damper door 14 off from its seat until, as shown in Fig. 3, brush 38 has, in the operation of opening the damper, passed entirely out of notch 42 in commutator 40, and come into electrical contact with wheel 40. The reason for this is also important.

Assume that damper 14 were positively connected to crank 22 so that any movement whatever of the parts would move damper 14, and that, by accident or mischievous intent by some outside person, thermostat 30 will be thrown momentarily into engagement with contact 32, thus causing the opening operation heretofore described to begin; and that the contact between the thermostatic element and contact 32 were broken after damper 14 had begun to open and before brush 38 were out of notch 42 and in electrical contact with wheel 40. The air going through the partial opening under damper 14 and into the furnace would start up the fire, thus making heat in the room and ultimately throwing thermostat 30 into engagement with contact 34, but brush 38 being still in notch 42 and out of electrical engagement with wheel 40, the completion of the circuit through brush 38 to start the motor to close the damper would be prevented, with the result that excessive heating of the room controlled by the thermostat and possible ultimate fire damage would take place because of the inability of the device to operate to throw the damper 14. All these objections are obviated by the construction of this invention in which the rope, cord or chain 20, or other connecting device between the damper door and the operating mechanism, is made with sufficient lost motion so that damper 14 cannot begin to open until the brush 38 is out of notch 42 and in electrical engagement with wheel 40; in which condition of the parts, if excessive heating occurs, as above described, and thermostat 30 engages contact 34, current instantly passes through brush 38 to start the motor 48 and thus rotate the parts from the position of Fig. 3 through the position of Fig. 4 and thence to the position of Fig. 1, thus closing the damper and stopping the heat.

The mechanism of this invention may be applied to many other devices than heat dampers without departing from the invention.

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

1. In a device of the class described, a single motor, a commutator rotatable by said motor in a single direction, a brush adjacent to the commutator, said brush when in contact with the commutator forming part of an electric circuit adapted to control said motor, means on the commutator preventing electrical contact between the brush and commutator during a portion of the commutator's revolution, a member to be moved, and a mechanism operatively connecting said member to be moved with the motor, there being sufficient play or lost motion in the connecting device to prevent movement of the member to be moved by the motor during any part of the time that the brush is out of contact with the commutator, even though the commutator be moved by independent means.

2. In a device of the class described, the combination with a member to be opened and closed, an operating member therefor adjacent thereto, a commutator member movable with the operating member, a pair of brushes normally engaging the commutator in opposite portions thereof, means at one point on the commutator traversed by said brushes adapted to prevent one brush from then bearing on the commutator, electrically propelled mechanism operating through circuits, each passing through a selected one of said brushes adapted to move the operating member, except when the brush in that particular circuit is out of contact with the commutator, and a connection between the operating member and the member to be opened and closed provided with sufficient lost motion between the parts so connected that the member to be opened and closed cannot be moved from its closed

position when either of said brushes is out of contact with the commutator.

3. In a device of the class described, in combination with a member to be opened and closed, a completely rotatable member adjacent thereto adapted to operate the first mentioned member, a commutator rotatable with the operating member, a pair of brushes, one on each opposite side of the commutator, normally bearing thereon, means on one point on the commutator adapted, when adjacent to a given brush, to prevent its contacting with the commutator, electrically propelled mechanism operating through circuits passing through a selected one of said brushes for rotating the commutator and operating member, except when the particular brush in the particular circuit then doing the operating is out of contact with the commutator, and a connection between the operating member and the member to be opened and closed constructed with sufficient lost motion between the operating member and the member to be opened and closed, so that the last mentioned member cannot be moved from its closed position when one of the brushes is out of engagement with the commutator.

4. In a device of the class described, the combination with an electric motor and a thermostatic device adapted to move between two positions as the heat in a given room varies, an electric control device for starting and stopping said motor adapted to be operated by the thermostat through different electric switching devices whenever the thermostatic device is in either of its two extreme positions, a member to be controlled by the device located adjacent thereto, and a flexible connection between it and the motor mechanism having sufficient lost motion in the connection so that the movable member to be controlled cannot leave its initial position except when the electric control device is under the control of that part of the mechanism which operates the device when the thermostatic element is in the position for cooling the room.

5. In a device of the class described, the combination with a pivoted member to be controlled gravity-operated in one direction, a shaft above said member to be controlled, a crank on said shaft, a circular commutator member also on said shaft, means at one point in the commutator for preventing a brush obtaining electrical connection therewith, a pair of brushes on opposite sides of the commutator and in the same plane as said preventing means, a motor device for operating said shaft, a thermostatic device movable between two contacts in connection with one of which a circuit is formed through one of the brushes on the commutator and the motor to rotate said commutator until such time as said brush comes in contact with the non-connecting portion of the contact, and in connection with the other of which a circuit is formed in the same way through the other of said brushes to similarly rotate the shaft, and a flexible connection between the crank and the member to be controlled having therein sufficient lost motion so that the member to be controlled is never moved from its extreme lower position while either brush is in engagement with the non-conducting portion of the contact.

6. In a device of the class described, a single motor, a commutator rotatable by said motor in a single direction, a brush adjacent to the commutator, said brush when in contact with the commutator forming part of an electric circuit adapted to control said motor, means on the commutator covering less than one-quarter of the circumference of the commutator preventing electrical contact between the brush and commutator during such portion of the commutator's revolution, a furnace door located below the foregoing mechanism and normally closed by gravity, means operatively connecting said furnace door with the motor mechanism, there being sufficient play or lost motion in the connecting device so that the furnace door cannot be started with opening movement during any part of the time while the brush is out of contact with the commutator, for the purposes set forth.

In witness whereof, I have hereunto subscribed my name in the presence of two witnesses.

WM. A. LACKE.

Witnesses:
F. A. HARPER,
C. E. BUCKLEY.