No. 637,175. Patented Nov. 14, 1899.

F. J. SPRAGUE.

AUTOMATIC DAMPER AND VALVE REGULATOR.

(Application filed Apr. 3, 1899.)

(No Model.) 2 Sheets—Sheet 1.

FIG. 1.

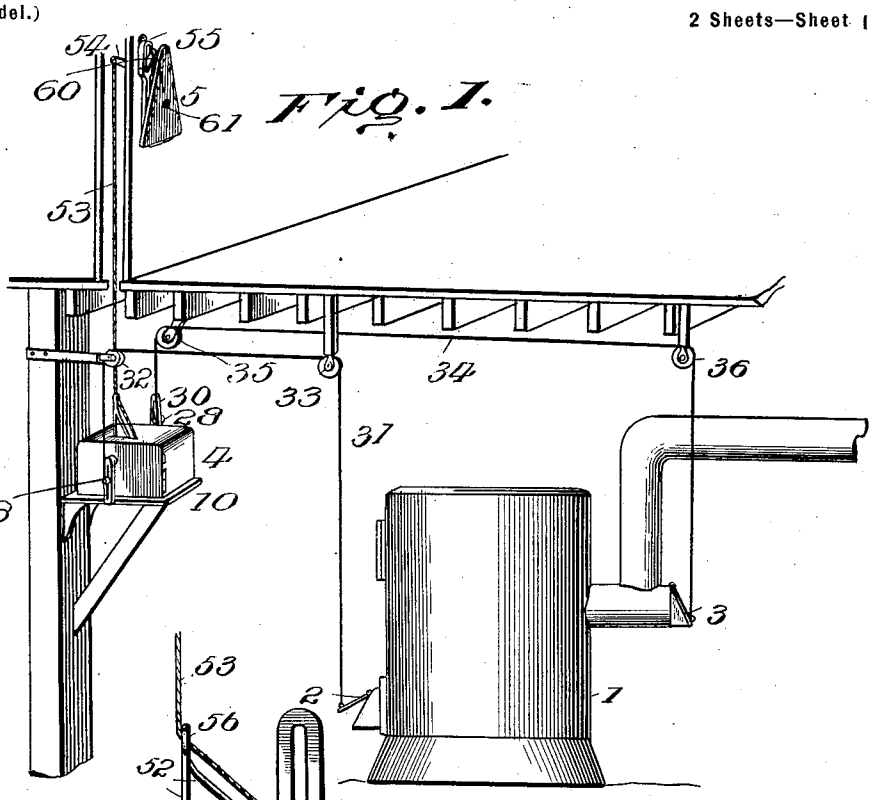

FIG. 2.

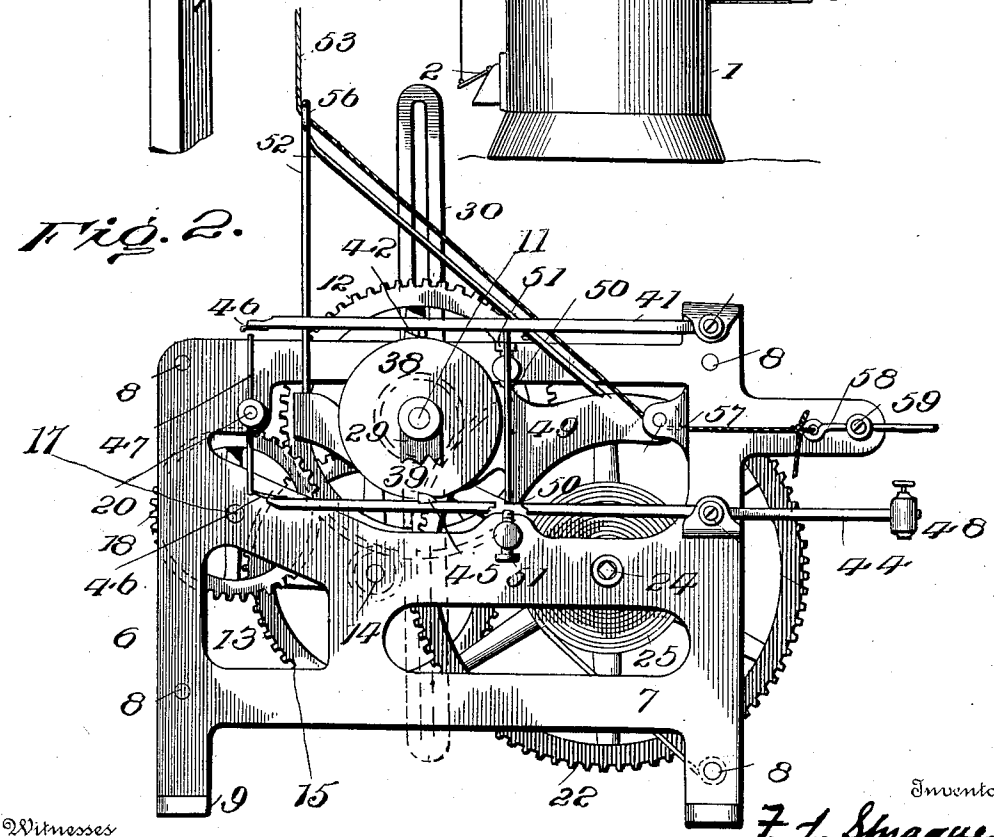

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FIG. 3.

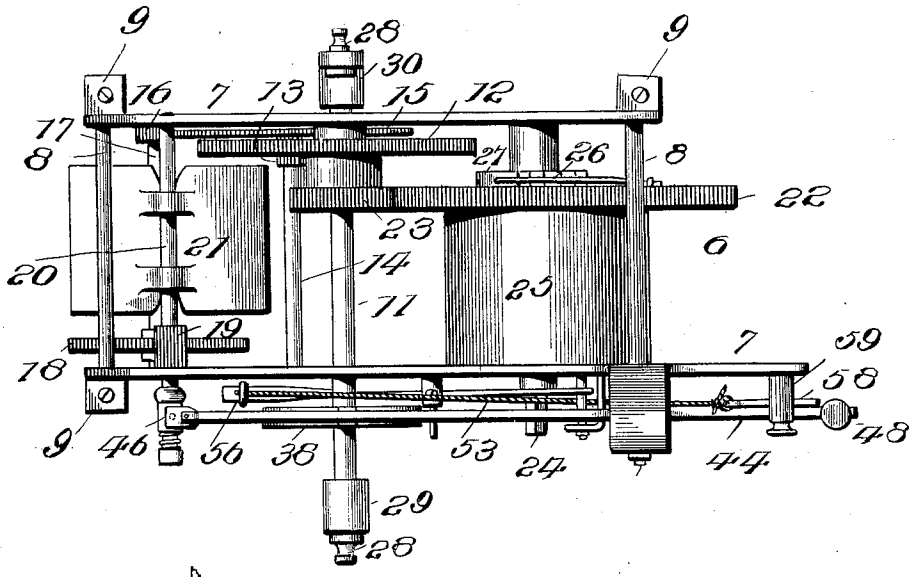
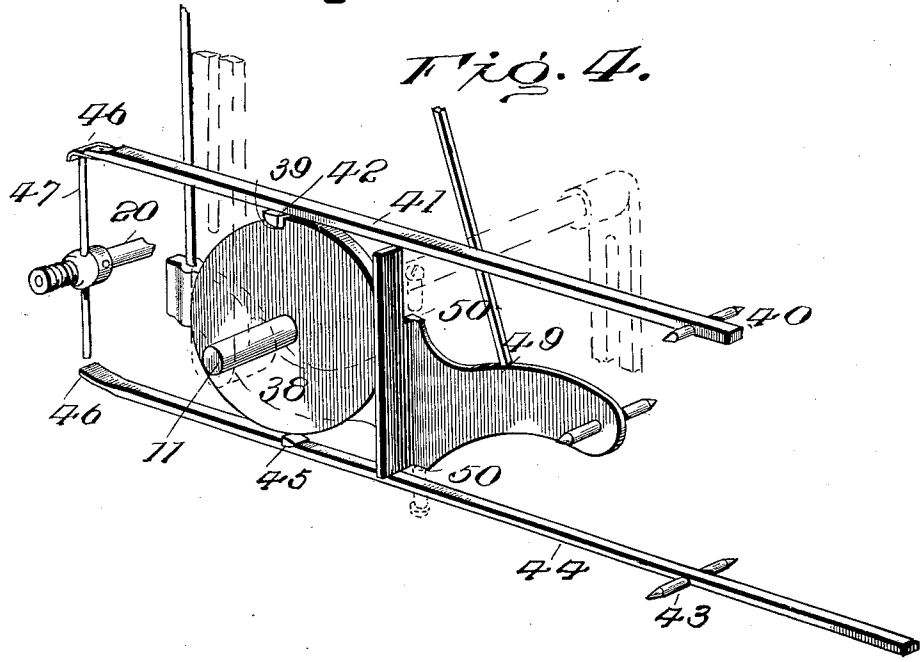


FIG. 4.



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UNITED STATES PATENT OFFICE.

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AUTOMATIC DAMPER AND VALVE REGULATOR.

SPECIFICATION forming part of Letters Patent No. 637,175, dated November 14, 1899.

Application filed April 3, 1899. Serial No. 711,590. (No model.)

To all whom it may concern:

Be it known that I, FRANK J. SPRAGUE, a citizen of the United States, residing at Oswego, in the county of Oswego and State of New York, have invented certain new and useful Improvements in Automatic Damper and Valve Regulators; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to devices for automatically controlling dampers and valves of heaters, &c., to control the combustion and thereby regulate the temperature in rooms or apartments deriving their heat from such heating apparatus; and it consists, essentially, in providing a suitable mechanical motor, arranged to operate the dampers of the heating apparatus, with certain novel mechanism and operating the same by means of a suitable thermostat to start and stop said mechanical motor.

The invention further consists of the general combination and arrangement of the mechanism for controlling the action of the mechanical motor, as will be hereinafter more fully described, and particularly pointed out in the claims.

The primary object of the invention is to provide a mechanism sufficiently powerful to operate the heaviest dampers and yet so sensitive in its action that the slighest change in the temperature of the room or apartment in which the initial motive power (the thermostat) is located will set into motion the mechanism by means of which the motive power for controlling the dampers is set into motion and stopped.

Other objects of the invention will be made apparent upon the further description thereof.

In the accompanying drawings, Figure 1 is a side elevation of an ordinary furnace, showing my invention applied to the check and draft dampers thereof; Fig. 2, a side elevation of the mechanical motor, showing the starting and stopping mechanism attached thereto; Fig. 3, a top plan view of the same, and Fig. 4 a detached perspective view of the mechanism controlling the action of the mechanical motor.

Referring to the several views, the numeral 1 indicates an ordinary furnace or heater provided with the usual draft and check dampers 2 and 3, respectively.

The numeral 4 indicates a mechanical motor comprising any suitable train of gearing, and 5 any suitable thermostat, preferably like that shown in Patent No. 488,895, granted to C. D. Howard December 27, 1892. In the present instance the mechanical motor is constructed as follows:

The numeral 6 indicates the frame, which is preferably composed of two skeleton side plates 7, connected together at their respective corners by rods or bars 8 and provided with suitable lugs 9, by means of which said frame may be secured to a suitable supporting shelf or bracket 10. Journaled in the side of the frame is a shaft 11, on which is secured a gear-wheel 12, which gears with a pinion 13, secured on a shaft 14. Also secured on the shaft 14 is a gear-wheel 15, which meshes with a pinion 16, secured on a shaft 17. At the opposite end of the shaft 17 is secured a gear-wheel 18, which meshes with a pinion 19, secured on a shaft 20, provided with the usual regulating-fan 21. These several gears are driven by means of a main driving-gear 22, meshing with a small gear-wheel 23, secured in the shaft 11. The main driving-gear is mounted upon a winding-shaft 24 in such manner that the main driving-gear will not be affected during the winding of the spring 25, one end of which spring is secured to said winding-shaft and the other end to one of the connecting rods or bars 8, as shown in dotted lines in Fig. 2. Secured on the winding-shaft is a ratchet-wheel 26, which is engaged by a spring-actuated pawl 27 to prevent the winding-shaft from turning backward during the winding operation.

Each end of the shaft 11 projects beyond the outer sides of the frame and has adjustably mounted thereon a slotted arm, in which is adjustably secured a stud 28. One of these arms I designate the "draft-damper" arm 29 and the other the "check-damper" arm 30. Attached to the draft-damper arm 29 by means of the stud 28 is one end of a cord or chain 31, which passes over pulleys 32 and 33 and has its other end secured to the draft-damper. The

check-damper arm 30 is connected to the check-damper by means of a cord or chain 34, which passes over pulleys 35 and 36. The arms 29 and 30 extend in opposite directions, so that as one damper is being opened the other is being closed, and vice versa.

The mechanism for controlling the action of the mechanical motor is constructed as follows:

Secured on the shaft 11 at one side of the frame is a disk 38, having a notch 39 in its periphery. Pivoted on a shaft 40, journaled in cone-bearings, is an upper stopping-lever 41, provided with a lug 42, which is adapted to enter the notch 39 in the disk 38. Fulcrumed on a shaft 43, also journaled in cone-bearings, is a lower stopping-lever 44, which is provided with a lug 45, also adapted to enter the notch 39. The free end of each stopping-lever terminates in or is provided with an engaging finger 46, which is adapted to engage a detent-arm 47, loosely mounted upon the projecting end of the shaft 20 to prevent undue strain upon the parts or injury thereto when the operation of the motor is checked by the engagement of the lug on the levers with the notch in the disk, which would occur if the detent-arm was rigid on the shaft. The outer end of the lower stopping-lever is provided with a weight 48, which may be adjusted at the required point and there securely held by any suitable means.

The numeral 49 indicates an actuating-block, which is preferably pivoted at one end to the side of the frame. This actuating-block is provided with shoulders 50, and seated in suitable studs projecting from the side of the frame are adjustable set-screws 51, by means of which the up-and-down movement of said actuating-block is limited.

The numeral 52 indicates an inverted-V-shaped yoke attached to the actuating-block, one arm being attached to the forward end of the block and the other arm at any suitable point in rear of the first point of attachment. The rear arm serves as a brace to stiffen the forward arm and hold it rigidly in proper position.

It will be observed that the actuating-block is situated intermediate of the upper and lower stopping-levers and is designed to have a slight vertical movement between the set-screws 51, for the purpose to be hereinafter explained.

The connection between the mechanism for controlling the mechanical motor and the thermostat or initial motive power consists of a suitable cord or chain 53, one end of which is secured to one end of a bell-crank lever 54, which is pivoted to the vertical standard 55 of the thermostat. The other end of the cord passes through an eye 56 of the yoke 52, thence through a guide 57 on a line with the center of the axis of shaft 37, and is secured to one end of a pin 58, adjustably secured in a binding-post 59, attached to the frame. The other end of the pivoted bell-crank lever is connected by a chain 60 to a short crank-arm (not shown) secured on the rear end of the operating-shaft 61, which is provided with the usual pointer to indicate the degrees of temperature to which the thermostat may be adjusted, the degrees being marked on a dial secured to the face of the thermostat.

The operation of the device is as follows: The thermostat being properly adjusted and the dampers in the position shown in Fig. 1, when the temperature in the room in which the thermostat is situated rises above the predetermined degree the thermostatic plate will curve toward the wall or standard, slackening the cord 53 and permitting the outer end of the actuating-block 49 to drop down until the lower shoulder 50 rests upon the set-screw 51. In dropping the shoulder strikes against the lower stopping-lever and overcoming the weight 48 forces the free or engaging end of said lever out of engagement with the detent-arm 47 and incidentally the lug 45 out of the notch 39 of the disk 38, thus setting in motion the mechanical motor. During the rotation of the disk 38 both stopping-levers will ride freely upon the periphery of said disk until the notch 39 comes under the lug 42 on the upper stopping-lever, when the said lever will drop of its own weight and bring the engaging end into engagement with the detent-arm 47, stopping the operation of the mechanical motor. While this operation is taking place, the draft-damper is being closed and the check-damper being opened. When the temperature falls below the predetermined point, the thermostat will curve from the wall, tightening the cord 53. This action will cause actuating-block to rise until the upper shoulder 50 rests against the upper set-screw 51. As the actuating-block is raised the upper end thereof strikes against the upper stopping-lever, raising its engaging end out of engagement with the detent-arm 47 and the lug 42 out of the notch 39. The mechanical motor is then free to operate to close the check-damper and open the draft-damper.

In adjusting the device for operation at a certain temperature all that is necessary to be done is to turn the pointer to the desired degree and when the thermometer in the room registers that degree adjust the actuating-block 49 until the respective shoulders 50 are an equal distance from the set-screws 51. This is accomplished by tightening or loosening the cord 53, as the case may be, by means of the adjustable pin 58 and binding-screw in post 59.

While I have described my invention as applied to regulating and controlling the dampers of a furnace or heater, it will be understood that it is equally applicable to operating valves, ventilators, and other similar devices in heating systems.

Various modifications may be made in my invention without changing its principle or sacrificing the spirit thereof—such, for in-

stance, as substituting a spring for the weight 48 or a vertically-sliding actuating-block for the pivoted block.

It will be noted that the principal object of the actuating-block is to serve as a means for raising the upper stopping-lever and depressing the lower stopping-lever, so as to release the detent-arm and set the mechanical motor into operation. Hence I do not wish to be understood as limiting myself to any specific construction of actuating-block.

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

1. In a device for automatically controlling the temperature in buildings, the combination with a mechanical motor, connected with the dampers or valves of a heating apparatus, of mechanism for controlling the action of the mechanical motor, the same consisting of a notched disk, a pair of levers adapted to alternately engage the notch in said disk, a rotatable detent-arm arranged to be engaged by said levers, and an actuating-block adapted to alternately raise and depress the levers, and an initial motive power, connected with the actuating-block, adapted to actuate said block to set in motion the mechanical motor.

2. In a device for automatically controlling the dampers of a heating apparatus, the combination with a mechanical motor connected with said dampers, of mechanism for starting and stopping the motor, the same consisting of a notched disk, a pair of levers adapted to alternately engage the notch in said disk, a rotatable detent-arm arranged to be engaged by said levers, and a pivoted actuating-block arranged intermediate of the levers, and a thermostat connected with the actuating-block, whereby a change in temperature will cause the starting and stopping mechanism to alternately operate and stop the mechanical motor.

3. In a device for automatically controlling the temperature in buildings, the combination with a mechanical motor connected with the dampers or valves of a heating apparatus, of a rotatable disk, provided with a notch, a pair of levers adapted to alternately engage the notch, a rotatable detent-arm arranged to be engaged by said levers, a pivoted actuating-block interposed between said levers, means for adjusting said block, and a thermostat connected with the actuating-block, whereby a change in temperature will cause the operation of the mechanical motor.

4. In a device for automatically controlling the temperature in buildings, the combination with a mechanical motor connected with the dampers or valves of a heating apparatus, of mechanism for controlling the action of the mechanical motor, an adjustable thermostat, a connection between the thermostat and motor-controlling mechanism, and means attached to said connection, whereby the motor-controlling mechanism may be adjusted.

5. The combination with the shaft-carrying devices connected with the dampers or valves of a heating apparatus, of a rotatable disk, provided with a notch, a pair of pivoted levers, each provided with a lug adapted to enter said notch, a rotatable detent-arm arranged to be engaged by the levers, a thermostat, an actuating-block interposed between the pivoted levers, and means connecting the thermostat with the actuating-block, substantially as specified.

6. The combination of a rotatable disk provided with a notch, upper and lower pivoted levers adapted to engage the notch in the disk, a rotatable detent-arm arranged to engage the free ends of the levers, a pivoted actuating-block interposed between the levers, adjusting-screws for limiting the vertical movement of the actuating-block, a thermostat, a yoke attached to said actuating-block, and a cord or chain connecting the thermostat with said yoke, substantially as specified.

7. The combination of a rotatable disk provided with a notch, upper and lower pivoted levers adapted to engage the notch in the disk, a rotatable detent-arm arranged to be engaged by the inner ends of the levers, an actuating-block interposed between said levers, means for limiting the vertical movement of the actuating-block, a yoke attached to said actuating-block, a thermostat, a cord or chain connecting the thermostat with the yoke, and means connected to the cord or chain for adjusting the actuating-block, substantially as specified.

8. The combination of a rotatable disk provided with a notch, a pivoted gravity-lever adapted to engage the notch in the disk, a pressure-lever also adapted to engage the notch in said disk, a rotatable detent-arm arranged to be engaged by the inner ends of the levers, an actuating-block interposed between said levers, and a thermostat connected to the actuating-block, substantially as specified.

9. The combination with a mechanical motor connected with the dampers or valves of a heating apparatus, of mechanism for controlling the action of the mechanical motor, a thermostat, a connection between the thermostat and motor-controlling mechanism, and an adjustable sliding device attached to said connection, whereby the motor-controlling mechanism may be adjusted to operate at a predetermined temperature.

In testimony whereof I affix my signature in the presence of two witnesses.

FRANK J. SPRAGUE.

Witnesses:
J. J. NELLIGAN,
T. T. F. JOHNSON.