J. HARRINGTON.

HEATING APPARATUS.

APPLICATION FILED NOV. 9, 1916. RENEWED FEB. 24, 1922.

1,418,871.

Patented June 6, 1922.

2 SHEETS—SHEET 1.

Fig. 1.

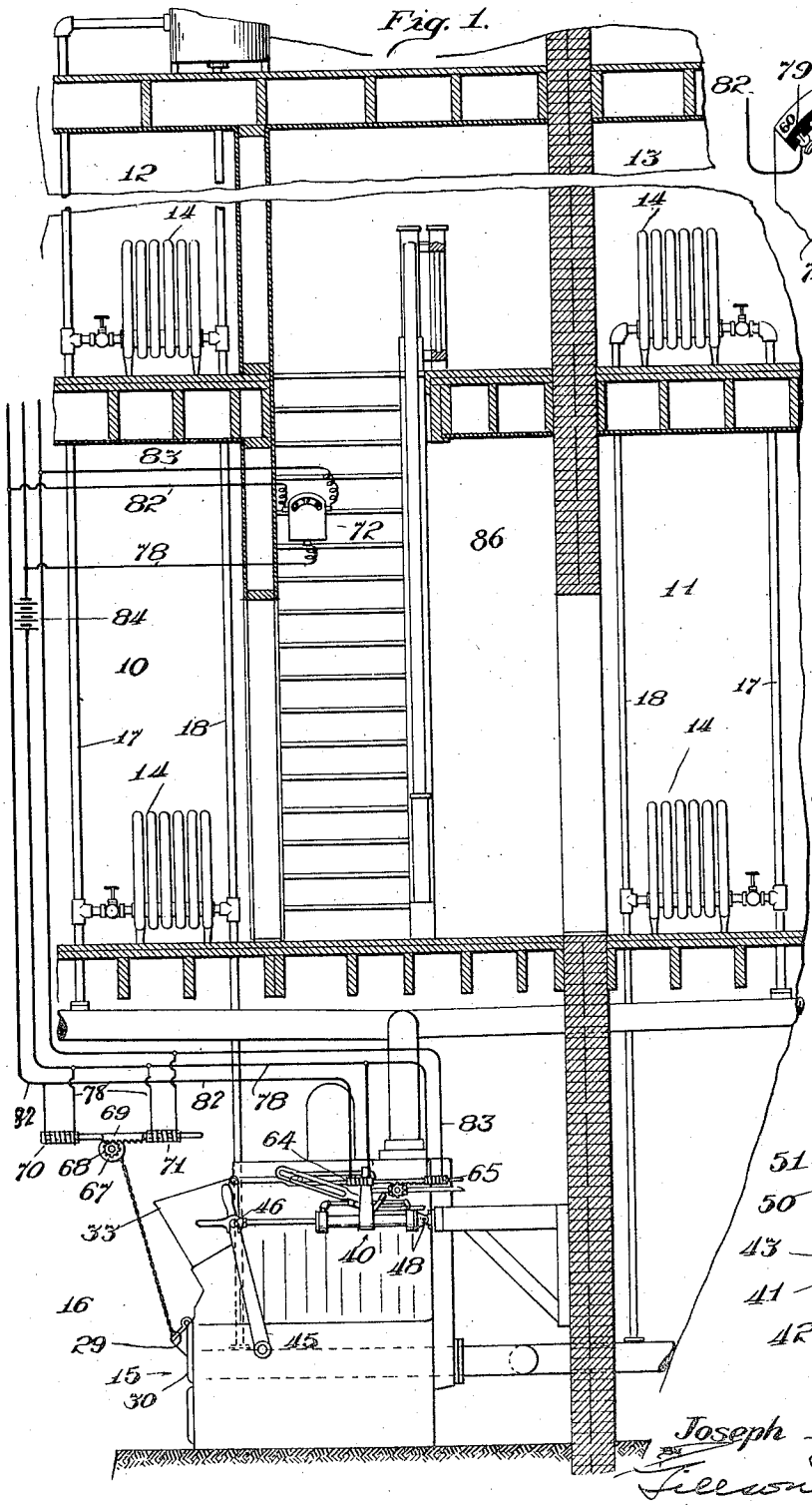


Fig. 2.

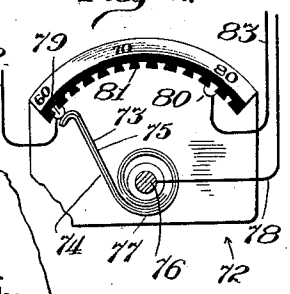
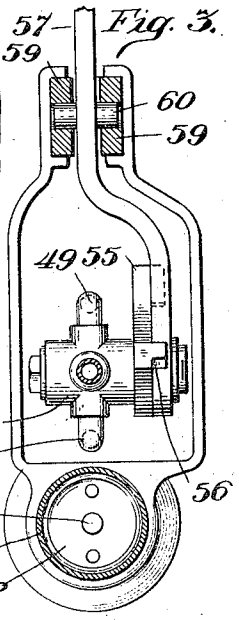


Fig. 3.



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2 SHEETS—SHEET 2.

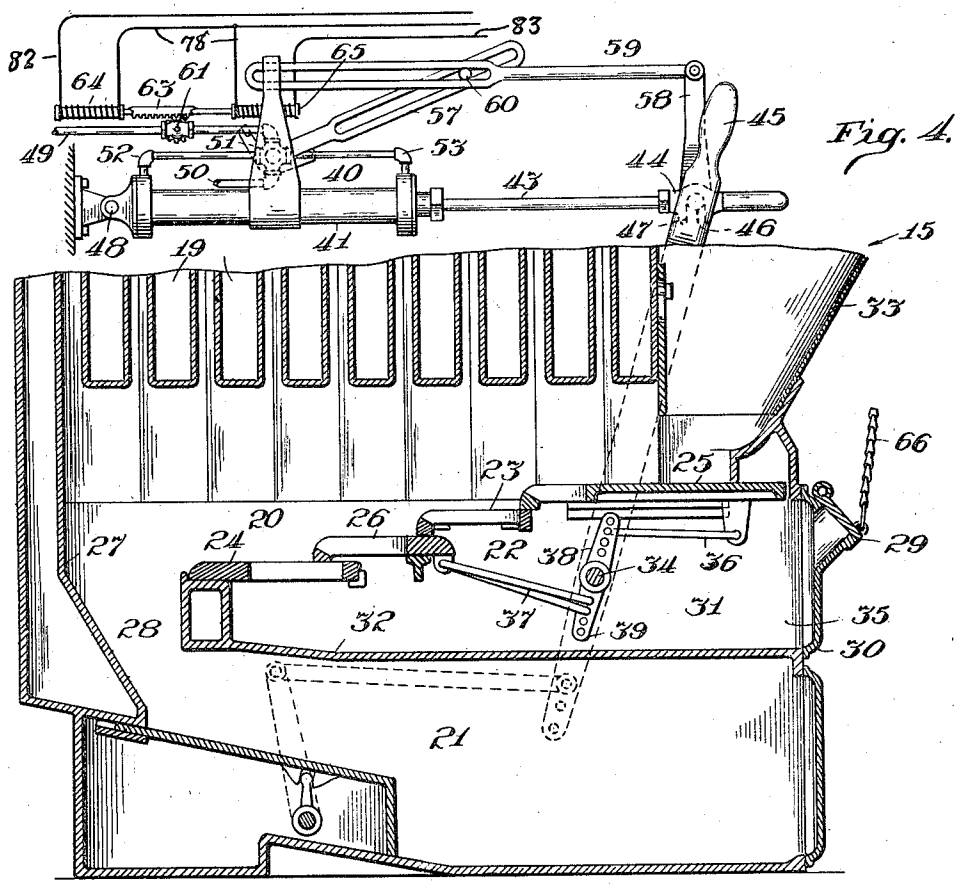


Fig. 4.

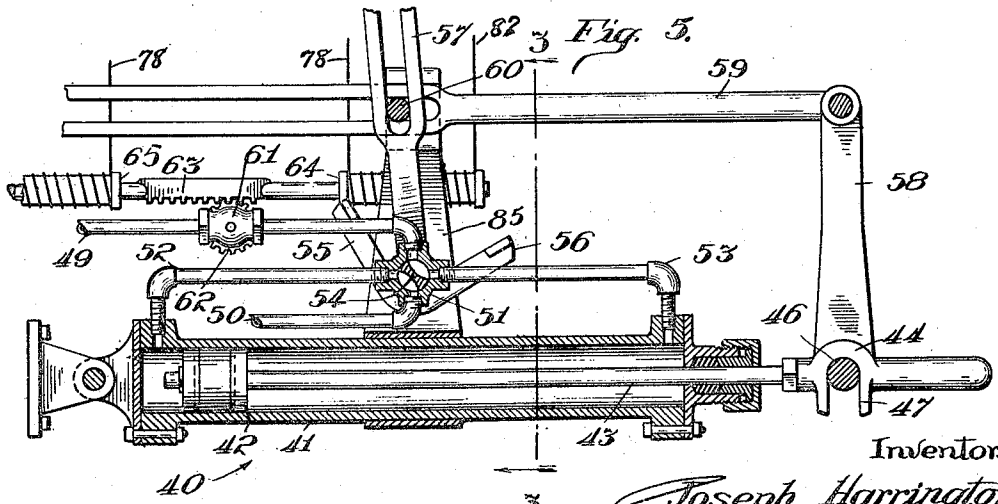


Fig. 5.

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UNITED STATES PATENT OFFICE.

JOSEPH HARRINGTON, OF RIVERSIDE, ILLINOIS.

HEATING APPARATUS.

1,418,871. Specification of Letters Patent. Patented June 6, 1922.

Application filed November 9, 1916, Serial No. 130,351. Renewed February 24, 1922. Serial No. 539,039.

To all whom it may concern:

Be it known that I, JOSEPH HARRINGTON, a citizen of the United States, and resident of Riverside, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Heating Apparatus, of which the following is a specification, and which are illustrated in the accompanying drawings, forming a part thereof.

The invention relates to the heating of buildings, more especially when a single furnace is employed for heating a number of rooms and provision is made for conveying a heated fluid from the furnace to the various rooms. The object of the invention is to secure greater economy in the operation of the furnace, both by reducing the amount of attendance necessary for replenishing the fuel and by confining the combustion of fuel to that required for maintaining the desired temperature in the several rooms.

The invention accordingly contemplates the provision of a variable speed stoker for the furnace and the use of a thermostat for regulating both the speed of the stoker and the amount of the air supplied for combustion of the fuel, the thermostat being located remote from the furnace and centrally with respect to the rooms to be heated.

In the accompanying drawings,

Fig. 1 is a detail sectional view illustrating a building with the improved heating apparatus installed therein, some of the parts being conventionally represented and other parts being shown in diagram;

Fig. 2 is an elevation of the thermostat drawn to a larger scale and with the front wall of the case removed;

Fig. 3 is a sectional view of the motor for actuating the stoker, the plane of the section being indicated by the line 3—3 on Fig. 5;

Fig. 4 is a sectional view of the furnace, some of the parts being broken away and the motor which actuates the stoker being shown in elevation, and

Fig. 5 is a central sectional view of the said motor with some of the parts shown in elevation.

For the purpose of illustrating one application of the invention the drawings show a so-called hot water heating system. A plurality of the rooms of a building are conventionally represented as 10, 11, 12, and 13, with a radiator 14 in each of the said rooms. The furnace is generally designated 15 and is shown as being located in the basement 16 of the building. Each of the radiators 14 has supply and return connections 17—18 with the furnace 15.

The particular construction of the furnace 15 forms no part of the present invention. That shown in the drawings is made the subject of my pending application for patent on furnace Serial No. 66,087, filed December 10, 1915, now Patent Number 1,402,419. The walls and water chamber of this furnace are preferably constructed by the connection of a plurality of chambered sections, as 19, in a well known manner. As shown, the sections 19 are constructed to enclose a fire box 20 and ash pit 21. The grate, as 22, is composed of a plurality of fixed sections, as 23—24, and movable sections, as 25 and 26. These grate sections are arranged in a descending series, forming steps or ledges, and the movable sections 25—26 are slidingly mounted for reciprocation in their respective planes. The lowest grate section, as 24, is located some distance from the rear end wall, as 27, of the furnace, forming a throat or passage 28 through which the ash is delivered over the end of the grate to the ash pit 21. In order that the air supplied for combustion, as through a damper 29 in the front wall 30, may all be required to pass through the fuel bed, the space, as 31, which is directly below the grate and with which the damper 29 communicates is separated from the ash pit 21 by a horizontal partition 32.

A fuel hopper 33 is employed to provide a continuous supply of fuel. As shown, this hopper is secured against the front wall of the furnace and the sliding grate section 25 extends under the hopper. While any convenient form of mechanism may be employed for reciprocating the sliding grate sections 25 and 26, this mechanism should preferably be arranged to impart a slow movement to these grate sections with but a small consumption of power. The arrangement shown includes a rock shaft 34 which extends through the space 31, directly below the grate, from side to side of the furnace and beyond the side wall, as 35, of the furnace, at one end. Links 36 and 37 connect the grate sections 25 and 26 with crank arms 38 and 39 of the rock shaft 34.

Power for oscillating the rock shaft 34 is conveniently supplied from a water motor, generally designated 40, but this rock shaft

may also be oscillated by hand when a considerable quantity of fuel is required to be supplied at one time, as when starting the fire. The water motor 40 is represented as comprising a cylinder 41 and piston 42. The outer end of the piston rod, as 43, is connected with a notched bracket 44. A hand lever 45 is applied to the projecting end of the rock shaft 34 and this hand lever is removably connected with the piston rod 43, as through a pin 46 which is fixed in the hand lever 45 and enters the notch, as 47, of the bracket 44. In order that the piston rod 43 may accommodate itself to the swinging movement of the hand lever 45 and to permit the bracket 44 being lifted out of engagement with the pin 46, when it is desired to oscillate the rock shaft 34 by hand, the cylinder 41 is swingingly mounted. For this purpose it is pivotally secured against a fixed support at one end, as at 48, (Fig. 4).

The construction contemplates the use of the domestic water supply for operating the motor 40. The water supply pipe is accordingly shown at 49 and a discharge pipe is indicated at 50. Both of these pipes are connected with a valve casing 51. Pipes 52 and 53 connect the valve casing 51 with the two ends of the cylinder 41. A valve 54 turns within the valve casing 51 and is movable between two positions for connecting the pipes 52 and 53 with the supply and discharge pipes 49 and 50, in alternation. The mechanism for turning the valve 54 includes two angularly separated crank arms 55 and 56, rigidly mounted upon the stem of the valve. A slotted arm 57 is also mounted upon the stem of the valve 54, but swings loosely thereon, as a pivot, and the valve 54 is turned between its two positions by the alternate engagement of the arm 57 with the crank arms 55 and 56. The position of the valve 54 is undisturbed throughout the strokes of the piston 42 in each direction but is quickly changed at the end of each stroke if the oscillations of the arm 57 are partly accomplished by the movements of the piston 42 and are completed by gravity. As shown, the bracket 44 is formed with an upright arm 58 and a slotted link 59 is connected with the arm 58 at its upper end. A bracket 85 which rises from the wall of the cylinder 41 serves for guiding the slotted link 59 and this link is operatively connected with the swinging arm 57 through a wrist pin 60 which slides in the slots of both of these members. This arrangement provides that the arm 57 is raised during the strokes of the piston 42 in each direction and passes an upright position just as each stroke of the piston is completed. The arm 57 then falls by gravity and turns the valve 54 by engagement with the crank arm 55 or 56.

The rate at which fuel is carried over the grate 22 is modified by varying the speed of the motor 40. A throttle valve 61 accordingly is provided in the water supply pipe 49. Mechanism for automatically adjusting this valve is conventionally represented as comprising a gear pinion 62, mounted on the stem of the valve, and a reciprocating gear rack 63 which meshes with the said pinion. The two ends of the gear rack 63 are constructed to serve as the cores of two solenoids 64 and 65. When this arrangement is employed the gear rack 63 is moved in one direction for opening the throttle valve 61, by energizing one of the solenoids, as 64, while energizing the other solenoids, as 65, serves to move the gear rack 63 in the opposite direction for closing the throttle valve 61.

The damper 29 is shown as being made in the form of a tilting plate. The damper is accordingly opened by raising the plate, as by pulling upon a chain 66. Similarly, releasing the chain 66 permits the closing of the damper. A mechanism for automatically moving the damper is therefore easily provided. Such a mechanism is conventionally represented as comprising a drum 67 upon which the chain 66 is wound. A gear pinion 68 is mounted upon the drum spindle and this pinion meshes with a reciprocating gear rack 69. The gear rack 69 is constructed to be moved in opposite directions by solenoids 70 and 71 in the same manner as the gear rack 63. Movement of the gear rack 69 in one direction, as by the energization of the solenoid 70, serves to wind the chain 66 upon the drum 67 for opening the damper 29. On the other hand, the energization of the solenoid 70 serves to rotate the drum 67 for releasing the chain 66 to permit the closing of the damper 29.

With the arrangement shown, an automatic regulation both of the rate at which fuel is delivered to the furnace and of the amount of air supplied for combustion, in accordance with variations in the temperature of the rooms to be heated, is readily accomplished by the use of a thermostat, generally designated 72. Preferably the thermostat 72 is centrally located with respect to the rooms, as 10, 11, 12, and 13, to be heated, as in a hallway 86. The thermostat 72 may comprise an arm, as 73, which is flexed by changes of temperature in a well known manner, as by being formed from two unlike metal strips 74—75. One end of the arm 73 is secured to a fixed support, as at 76, and, to increase the amount of movement at its other end, the arm is made of considerable length and part of the arm adjacent its fixed end is formed into a coil 77.

The function of the thermostat 72 is to close an electric circuit through the solenoids 64 and 70 when the temperature of the rooms, as 10, 11, 12, and 13, is too low, and to close an electric circuit through the sole-

noids 65 and 71 when the temperature of the said rooms is too high. As shown, a common lead 78 extends from the fixed end of the thermostat arm 73 to the source of current, to which source all of the solenoids 64, 65, 70 and 71 are connected. The thermostat 72 also comprises a pair of angularly separated contacts 79—80. These contacts are located in the path of movement of the free end of the arm 73 and they are preferably made adjustable, for engagement by the said arm in different positions of the latter. This adjustment may be accomplished in any convenient manner. For simplicity of illustration the thermostat 72 is shown as being formed with an insulated notched quadrant 81 and the several notches of the quadrant are constructed to interchangeably receive the contacts 79 and 80. A circuit wire 82 extends from the contact 79 to both of the solenoids 64 and 70. Similarly a circuit wire 83 extends from the contact 80 to both of the solenoids 65 and 71. It follows that if a source of electric energy, as a battery 84, is located in the lead 78, the solenoids 64 and 70 will be energized for increasing the speed of the motor 40 and raising the damper 29 when the arm 73 of the thermostat 72 comes into engagement with the contact 79. On the other hand, the solenoids 65 and 71 will be energized, for reducing the speed of the motor 40 and lowering the damper 29, when the arm 73 of the thermostat 72 comes into engagement with the corresponding contact 80. A suitable adjustment of the contacts 79 and 80 upon the thermostat 72 serves to maintain the temperature of the rooms, as 10, 11, 12, and 13, between the desired limits. Furthermore the combustion of fuel in the furnace 15 is confined to that required for maintaining the desired temperature in the several rooms and the furnace requires no attendance other than an occasional filling of the fuel hopper 33 and removal of ashes from the ash pit 21. It will, of course, be understood that the thermostat 72 should be located at a place where it will not be subject to direct influence from any windows (not shown) or from any of the radiators 14.

I claim as my invention,

1. In heat control apparatus, in combination, a thermostat having a moving part and low temperature and high temperature contacts, a mechanical stoker, control means therefor comprising positively acting accelerating and positively acting retarding means, a draft damper, control means therefor comprising positively acting means to open and positively acting means to allow said damper to close, electrical connections between said low temperature contact, said accelerating means and said damper opening means, electrical connections between said high temperature contact, said retarding means and said damper closing means and electrical connections between the said moving part of the thermostat and a source of current and between the source of current and each of said control means.

2. In a heat control apparatus, in combination, a thermostat having a moving arm, and high temperature and low temperature contacts arranged in the path of said arm, a furnace, air supply means for said furnace, a mechanical stoker for supplying solid fuel to said furnace, a pair of solenoids for controlling said air supply, a second pair of solenoids for controlling the operation of said stoker, an electrical connection between said low temperature contact and one solenoid of each pair, an electrical connection between said high temperature contact and the other solenoid of each pair, and electrical connection between the thermostat arm and the source of current and between each of the solenoids and the source of current.

3. The combination with a heating furnace for buildings of a variable speed mechanical stoker and a movable draft damper for the furnace, a thermostat located in a part of the building to be heated by the said furnace and having a moving part and low temperature and high temperature contacts, a controlling device for the furnace stoker comprising positively acting accelerating means and positively acting retarding means, a controlling device for the furnace draft damper comprising positively acting means to open the damper and positively acting means effective to allow the damper to close, electrical connections between the said low temperature contact of the thermostat, the said accelerating means of the stoker controlling device and the said opening means of the damper controlling device, electrical connections between the said high temperature contact of the thermostat the said retarding means of the stoker controlling device and the said closing means of the damper controlling device, and electrical connection between the said moving part of the thermostat and a source of current and between the source of current and both of the said parts of each of the said controlling devices.

JOSEPH HARRINGTON.