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H. C. SMITH.

THERMO ELECTRIC CONTROLLING MECHANISM.

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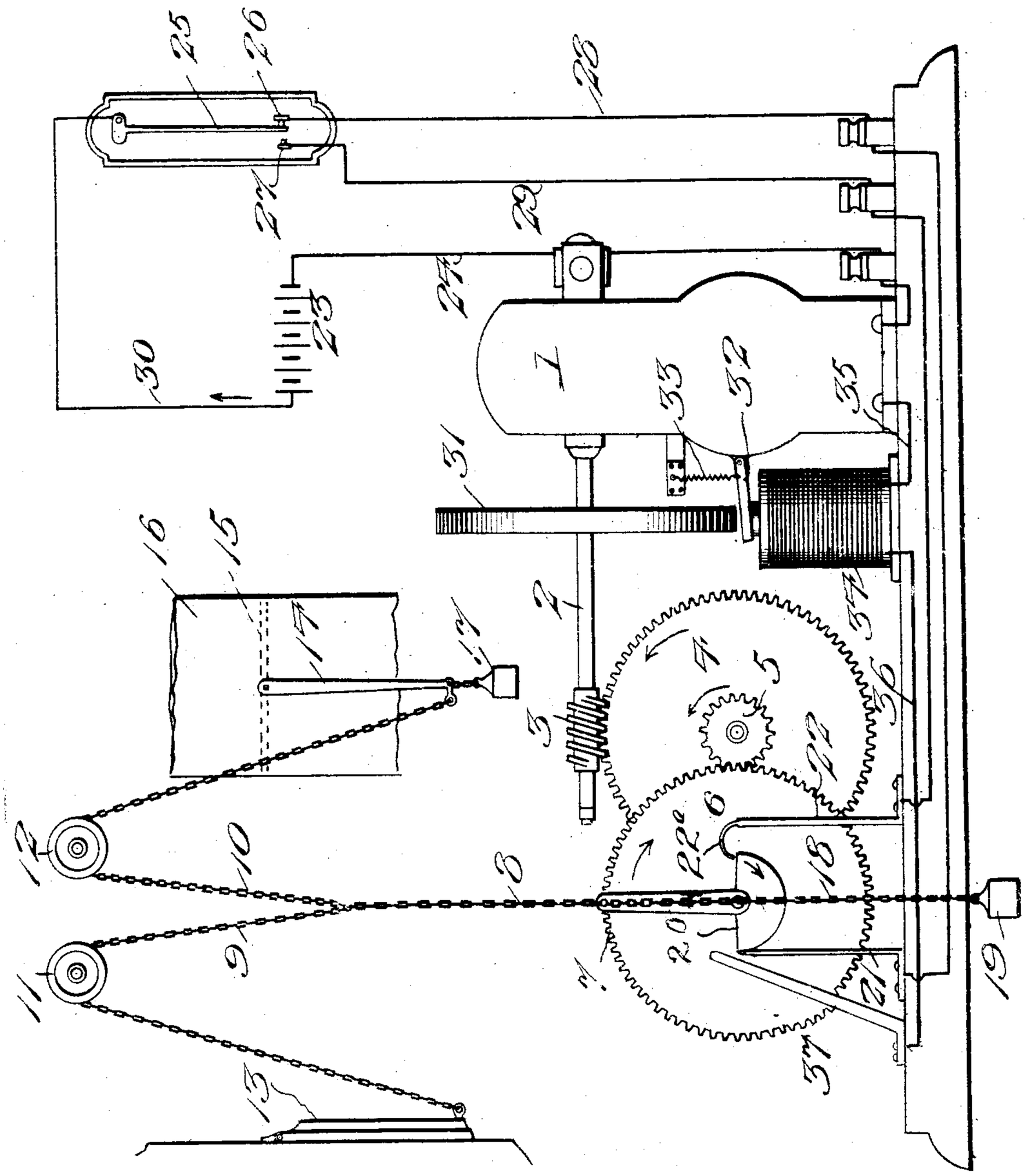

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THERMO-ELECTRIC CONTROLLING MECHANISM.

No. 867,846. Specification of Letters Patent. Patented Oct. 8, 1907.

Application filed October 7, 1905. Serial No. 281,830.

To all whom it may concern:

Be it known that I, HARRIE C. SMITH, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented new and useful Improvements in Thermo-Electric Controlling Mechanism, of which the following is a specification.

This invention relates to thermo-electrically-operated controlling mechanism, the object of the invention being to provide a simple, reliable and efficient mechanism automatically actuated by variations of temperature to operate a controlling device governing the action of a part or parts to be controlled, the invention being adapted for use as a draft regulator for furnaces, etc., and for many other useful purposes.

The accompanying drawing is a side elevation and diagram illustrating the invention as adapted for use as a draft regulator.

Referring now more particularly to the drawing, the numeral 1 represents an electric motor, the armature shaft 2 of which carries a worm 3 meshing with a driving gear wheel 4.

On the shaft of the gear wheel 4 is a pinion 5 which meshes with a power transmitting gear wheel 6, which is thus adapted to be driven by the motor.

To the shaft of the gear wheel 6 is fixed a controlling device 7, shown in the present instance in the form of a crank arm adapted for transmitting motion to the ash pit door and flue damper of a stove or furnace. As shown, the arm 7 is connected with an operating chain 8 which is attached to regulating chains 9 and 10 which pass over suitable guide pulleys 11 and 12, respectively, and are attached to the ash pit door 13 and the operating crank arm 14 of a damper 15 disposed in the flue pipe 16. The door 13 is of the hinge type and adapted to close by gravity, while the actuating arm 14 of the damper, which latter may be of any preferred construction, carries a weight 17 to adapt it to close by gravity. To the arm 7 is also connected a chain 18 carrying a counter weight 19, the function of which is to diminish the work required from the motor to open the dampers, as well as to diminish the work required from the motor in preventing a too sudden closing of the dampers.

Associated with the power transmitting gear wheel 6 is a circuit breaker comprising a semicircular commutator disk 20 and two commutator brushes 21 and 22, the latter having a resilient hook-shaped contact finger 22ª these brushes being so arranged that the brush 21 is in contact with the curved edge of the disk when the door and damper are closed, while the finger of the brush 22 is out of contact with the disk and is brought into contact therewith upon a prescribed movement of the gear wheel 6, so as to connect the parts for operation for the closing of the door and damper after they have been opened, as hereinafter described.

The motor 1 is supplied with current through an electric circuit in which it is arranged, said circuit being fed by a battery 23, from one pole of which leads a wire 24 connected with the motor casing and armature shaft 2. This circuit, which is completed by the wiring hereinafter described, is controlled by a thermostat 25 which is preferably of the thermostatic bar type and is arranged to play between two contacts 26 and 27. From the contact 26 extends a wire 28 which leads to the commutator brush 21, while from the contact 27 extends a wire 29 leading to the commutator brush 22. The thermostat is connected with the other pole of the battery by a wire 30 and is normally arranged to lie between the two contacts 26 and 27.

On the armature shaft 2 is a brake wheel or disk 31 which also acts as a fly-wheel and is adapted to be engaged by an armature brake 32 pivoted to the motor casing and normally held in contact with the periphery of said wheel by an actuating spring 33. The armature brake 32 is controlled by an electro magnet 34 connected by a wire 35 with the motor casing and by a wire 36 with a spring contact strip or brush 37 arranged to engage the power transmitting wheel 6. When the magnet 34 is energized the armature brake 32 is attracted thereby and drawn out of engagement with the brake wheel 31, thus permitting the shaft 2 to revolve. By providing the brake mechanism to act directly upon the armature shaft, the gearing may be brought to an easy and gradual stop without jar thereon and without the objectionable back strain resulting from the use of a brake acting on the driven train.

The drawing shows the parts in their normal position with the furnace door and damper closed and the thermostatic bar 25 represented as just having moved into engagement with the contact 26 from its normal position between the two contacts 26 and 27. In this position of the parts the brush 21 is in contact with the forward portion of the curved edge of the commutator disk in the direction of movement of said disk, while the end of the resilient finger 22ª of the brush 22 lies above the straight edge of the disk adjacent the rear portion of the curved edge of the disk. When the temperature in the building or compartment falls below that desired the thermostatic bar 25 moves as shown into engagement with the contact 26, thus closing the electric circuit, whereupon a current will pass from the battery 23 to and through wire 30, thermostat 25, contact 26, wire 28, brush 21, disk 20, wheel 6, brush 37,

wire 36, magnet 34, motor and back through wire 24 to battery. The magnet 34 will thus be energized and will draw the armature brake 32 out of engagement with the wheel 31, thus permitting the armature shaft 2 to be revolved and transmit motion through the gearing to the power transmitting gear 6, which will be revolved in the direction indicated by the arrow. As the gear 6 revolves the curved face of the commutator 20 rides in contact with the brush 21 until the gear makes a half revolution when the commutator will move out of engagement with said strip and the arm 7 will be moved to a position diametrically opposite that shown in the drawing. This operation of the arm 7 will draw upon the chains 9 and 10 and open the door 13 and damper 15. When the disk 20 moves out of engagement with the brush 21, it will simultaneously move into engagement with the finger 22^a of brush 22, and the circuit will be broken, as in this phase of operation the brush 22 is not disposed in the circuit. The breaking of the current will cause the magnet 34 to be deënergized, thus permitting the spring 33 to move the armature brake 32 into contact with the brake wheel 31 and arrest the motion of the armature shaft 2. The door and damper will thereby be held open, and the parts will be held in the prescribed position until the temperature in the building or compartment rises above the normal, when the thermostatic bar 25 will move into contact with the contact 27. A current from the battery 23 will thereby be caused to pass through wire 30, thermostat 25, contact 27, wire 29 to brush 22, thence through disk 20 and wheel 6 to brush 37, thence through wire 36 to magnet 34 and motor, and back through wire 24 to the battery, whereby the brake will be released and the motor operated to again drive the gear 6 in the same direction as before. The curved edge of the commutator will then ride in engagement with the finger 22^a of brush 22, and the arm 7 will be turned until the gear wheel completes its revolution and brings the arm back to its normal position, whereupon the commutator disk will move out of engagement with the brush 22 and into engagement with the brush 21, thus again breaking the circuit and causing the magnet to be deënergized and the armature to be thrown into contact with the brake wheel to arrest the movement of the motor. As the arm 7 moves upward to its normal position under the second half of revolution of the gear 6 the door 13 and damper 15 will close by gravity, the weight of the same being counterbalanced by the counterweight 19 so as to prevent them from closing too suddenly and throwing strain upon the gearing.

It will be observed that by the above described construction of the brushes 21 and 22 the free end of the brush 21 will lie in contact with the curved edge of the commutator disk 20 when the parts are in normal position and the furnace door and damper closed, while the hooked resilient finger 22^a of the brush will normally lie out of contact with the disk but in the plane of movement of the curved edge of the disk in its rotation from damper-opening to damper-closing position. Hence in the second half of the full rotary movement of the commutator disk the normally upper forward edge of the curved face of the latter will engage the free end of the finger 22^a, and the latter will thereupon ride upon said curved surface until the disk has made its complete revolution, when a restoration of the parts to the normal position shown in the drawing will occur. In this operation, it will of course be understood that the free end of the resilient finger will swing upward when the upper front portion of the disk comes in contact therewith, allowing the same to pass, and said finger will thereupon be maintained in contact with the curved edge of the disk by its resiliency. This construction provides for the proper arrangement and operation of the brushes, so that one brush or the other will be out of contact with the commutator disk, thus obviating the necessity of employing a disk having insulated portions in order to prevent short-circuiting. The cost of construction is thereby decreased and greater efficiency secured.

From the foregoing description, taken in connection with the drawing, the construction and mode of operation of the controlling mechanism will be readily understood, and it will be seen that the invention provides a simple, effective and reliable construction of means for controlling the operation of the arm 7 by which the door and damper are opened and governed in their closing movement. While I have shown the invention as adapted in the present instance for operating a stove or furnace door and damper, it will, of course, be understood that the arm 7 or its equivalent may be employed for operating other devices. The invention is, in fact, adapted to be employed for many useful purposes, and, if desired, the arm 7 may be adapted to perform the function of a switch for controlling a secondary circuit, whereby electric power may be supplied for operating devices of various kinds.

Having thus described the invention, what is claimed as new, is:—

1. In a device of the character described, the combination of a motor having its armature shaft horizontally arranged, a worm on said shaft, a vertically disposed driving gear meshing with the worm, a pinion fixed to turn with said driving gear, a vertically disposed transmission gear arranged in a plane parallel with the driving gear and meshing with the pinion, a controlling arm and semi-circular commutator disk fixed to rotate with said transmission gear, said disk having an uninsulated acting surface, a brush in contact with the transmission gear, a pair of brushes arranged vertically on opposite sides of the commutator and having contact portions arranged to be alternately engaged by the curved edge of the disk in the plane of rotation of the latter, a battery, a brake wheel on the motor shaft, a spring projected brake shoe supported adjacent said wall and adapted to engage the same, a magnet for retracting said shoe, a conductor connecting the motor, magnet and first named brush with one pole of the battery, a pair of contacts, a thermostat connected with the other pole of the battery and arranged to play between said contacts, and conductors respectively connecting said contacts with the commutator brushes.

2. A device of the character described embodying an electric motor, a gear-train driven by the motor, a semi-circular uninsulated commutator disk driven by the gear-train, a pair of brushes arranged on opposite sides of the commutator disk and adapted to engage the curved edge thereof, one of said brushes being normally out of contact with the disk and provided with a hooked resilient finger for coacting therewith, an electric circuit including said brushes, motor and gear-train, and a thermostat controlling said circuit.

3. In a device of the character described, the combination of a motor, a worm upon the armature shaft of the

motor, a drive gear meshing with said worm, a pinion driven by the gear, a power transmitting gear in mesh with the pinion, a semi-circular uninsulated commutator disk driven by the transmitting gear, a brush in contact with the transmitting gear, a pair of brushes arranged on opposite sides of the commutator disk and adapted to engage the curved edge thereof, one of said brushes being normally out of contact with said disk and having a hooked resilient finger for coaction therewith, a battery, a conductor connecting the motor and first-named brush with one pole of the battery, a pair of contacts, a thermostat connected with the other pole of the battery and arranged to play between said contacts, and conductors respectively connecting said contacts with the commutator brushes.

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

HARRIE C. SMITH.

Witnesses:
JAMES IRWIN,
JOHN CONKLIN.