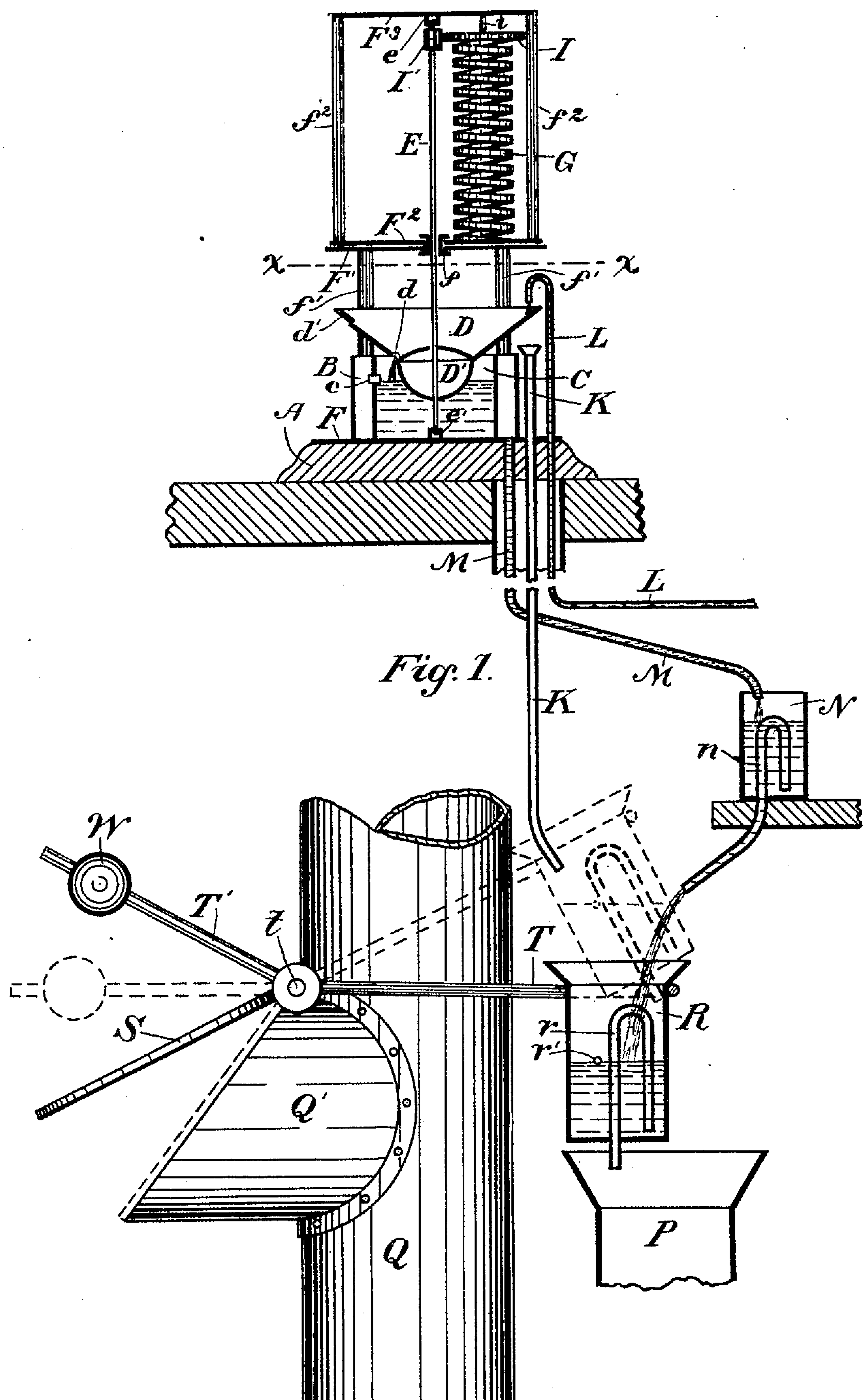
(No Model.)

2 Sheets—Sheet 1.

G. L. SHOREY.

HEAT REGULATING APPARATUS.

No. 460,996. Patented Oct. 13, 1891.



Witnesses
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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 2 Sheets—Sheet 2.

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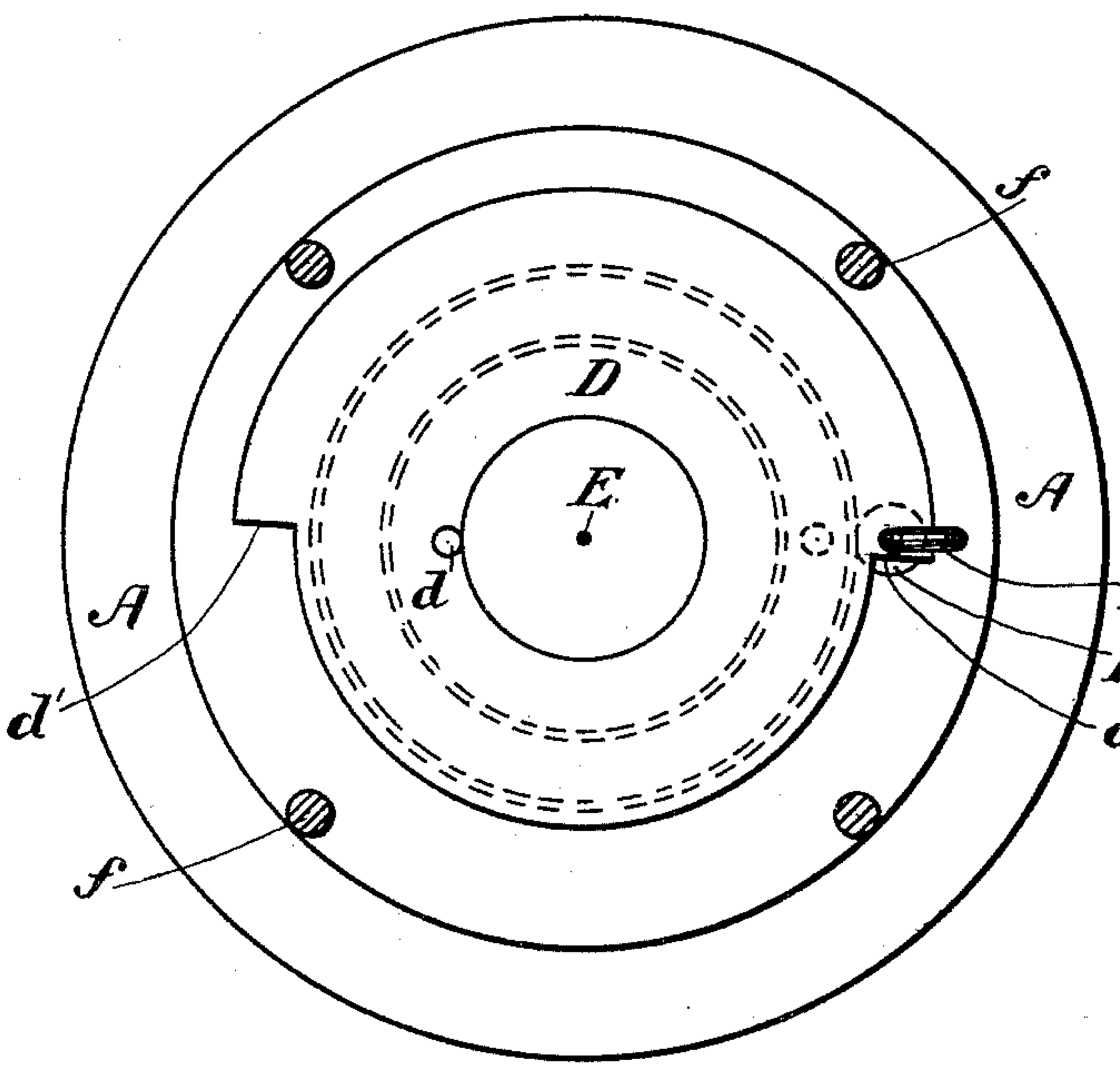

Fig. 2.

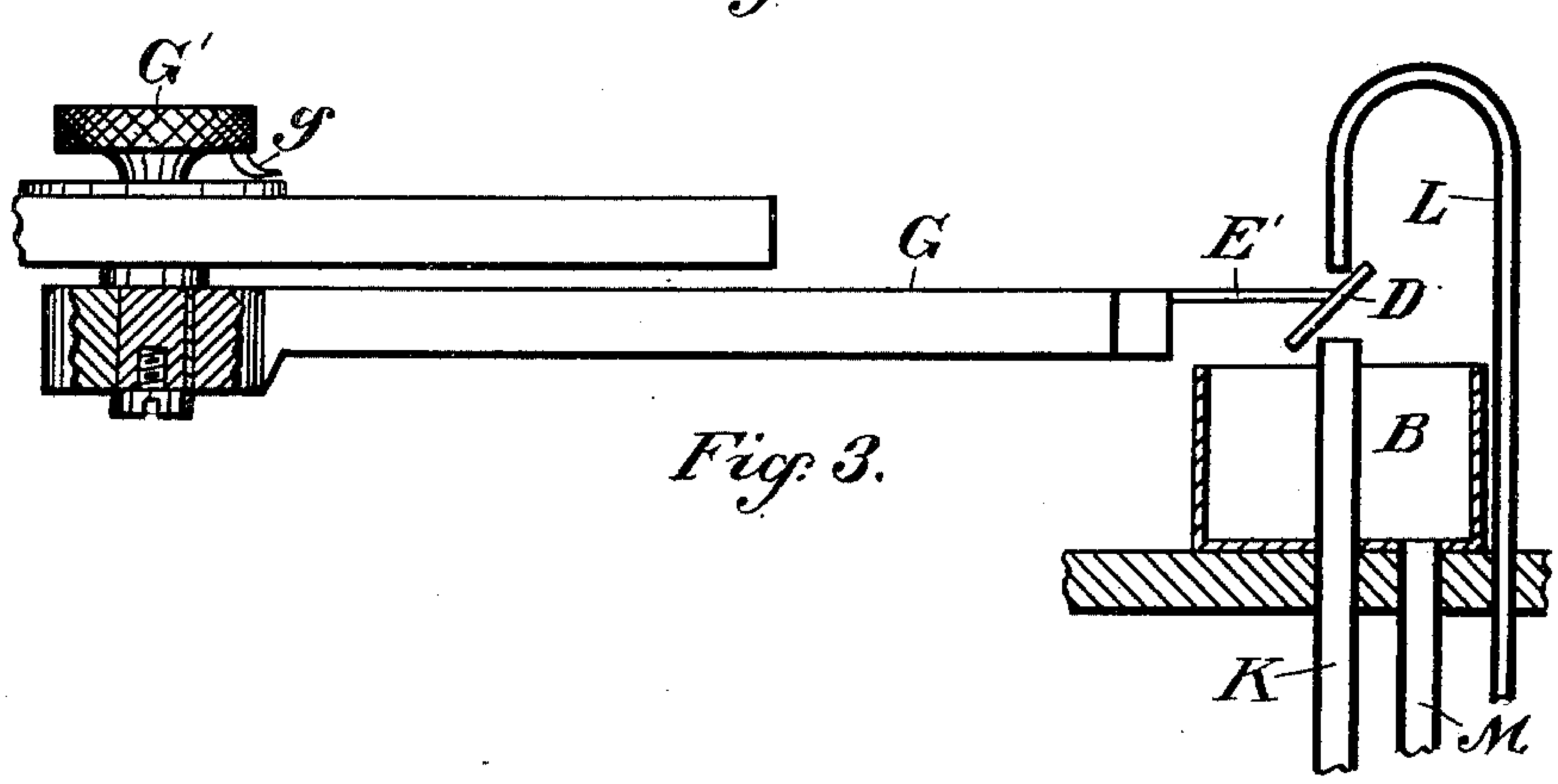

Fig. 3.

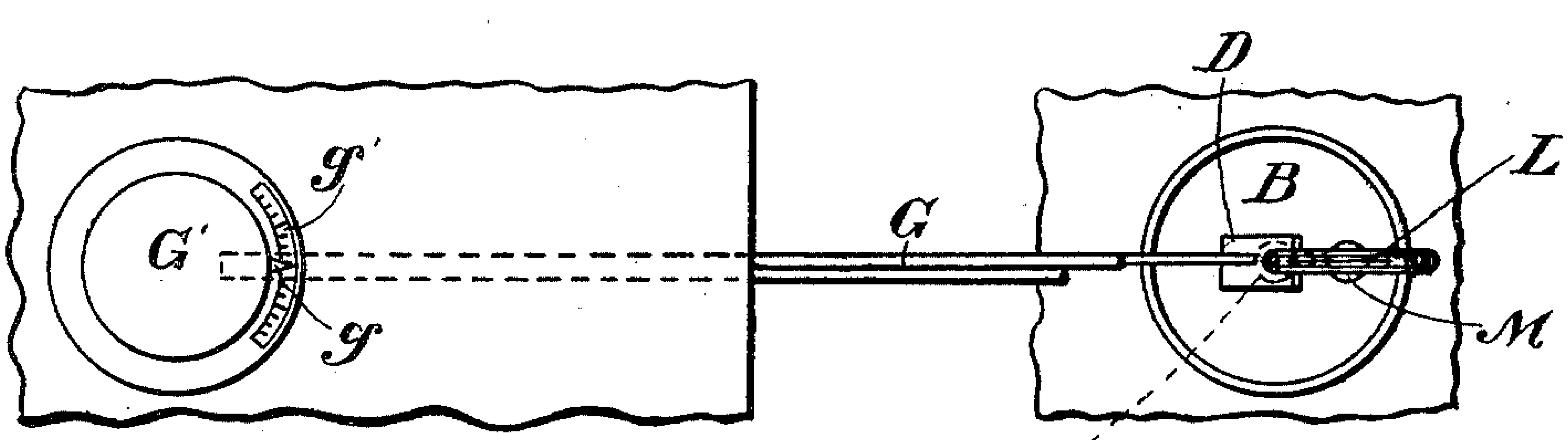

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Fig. 4.

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UNITED STATES PATENT OFFICE.

GEORGE L. SHOREY, OF LYNN, MASSACHUSETTS.

HEAT-REGULATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 460,996, dated October 13, 1891.

Application filed January 9, 1891. Serial No. 377,210. (No model.)

To all whom it may concern:

Be it known that I, GEORGE L. SHOREY, a citizen of the United States, residing at Lynn, in the county of Essex and Commonwealth of Massachusetts, have invented certain new and useful Improvements in Heat-Regulating Apparatus, of which the following is a full specification.

My invention consists of an improved apparatus for automatically operating the damper or dampers of a stove or furnace through the agency of a stream of water.

On the 10th of February, 1891, United States Letters Patent No. 446,212 were issued to me for an improved heat-regulating apparatus. In this patent is shown and described a hydraulic apparatus for operating a damper by means of alternately filling and emptying a vessel with water, thus constituting a variable weight, which acts against a constant weight to alternately open and close the damper. The water which does the work in this case is turned on and shut off by the alternate opening and closing of a valve by means of electro-magnets, the electric circuits being opened and closed directly or indirectly through the agency of a thermostat in the apartments to be heated.

My present invention has for its object the automatic operation of the stove or furnace damper or dampers by the flow of water in a different manner and without the aid of electricity. To this end I employ a fine constantly-flowing stream of water, adapted to flow into and through one or the other of two outlet-pipes passing to the damper-operating apparatus, which is so arranged that when the water flows through one of said outlet-pipes the damper is opened, and when through the other the damper is closed. A thermal motor consisting of a compound sensitive coil or strip in one of the apartments to be heated operates by changes of temperature upon a water-shed, which is thus moved beneath the mouth of the inlet-pipe, from which the stream of water falls in such a manner as to deflect the stream into one or the other of the outlet-pipes; or the arrangement may be such that the stream of water falling from the mouth of the inlet-pipe would naturally fall into one of said outlet-pipes—for example, the damper-opening pipe—unless deflected from this course by the water-shed, which by the change of temperature moves under the mouth of the inlet-pipe and deflects the stream therefrom, so that the water flows through the other outlet-pipe—viz., the damper-closing pipe.

Of the accompanying drawings, Figure 1 shows in section a form of apparatus embodying the principle of my invention. Fig. 2 is a section in the plane of $x x$, Fig. 1. Fig. 3 shows in elevation, partly in section, a modified form of device; and Fig. 4 is a plan view of the arrangement shown in Fig. 3.

Referring now to Figs. 1 and 2, B is an outer and C an inner cup, supported by the plate F, which in turn rests on and is secured to the base A. Arising from the lower plate F are the rods f', which supports the plate F'. On the frame thus formed of the plates F and F' and the rods f', which I term the "lower" frame, rests a second frame similarly constructed, consisting of the lower plate F^2, upper plate F^3, and rods f^2, connecting the two plates together. This forms the upper frame. The plates F' and F^2 are connected together by the hollow pivotal piece f in such a manner that the upper frame may be turned with reference to the lower around said pivotal piece as an axis for the purpose hereinafter to be seen.

G is a compound helical coil, one end of which is secured to the plate F^2, while the upper end is attached to a gear-wheel I, havfine teeth and adapted to turn on a pin i, secured to the top plate F^3. This coil is made of any suitable materials such that changes of temperature, even in the slightest degree, cause the coil to impart a movement to the gear-wheel I on its axis. The top plate F^3 of the upper frame (in which the compound sensitive coil is contained) has the bearing e, and the bottom plate F of the lower frame (containing the cups B and C) has the bearing e', in which bearings rests lightly the fine spindle-rod E, which passes down through the hollow pivotal piece f without touching the same. On this spindle-rod E is fixed the water-shed D, whose walls slope inward, so as to convey any water falling near the outer edge thereof toward the center. Near the top of the spindle-rod E is fixed thereto the pinion I′, which meshes with the gear I, thus imparting motion from the coil to the water-shed D.

L is the inlet water-pipe, which is preferably of small size, so as to deliver a fine stream of water. Directly beneath the mouth of the inlet-pipe L is one of the outlet-pipes K, so placed that the stream of water delivered from the mouth of the inlet-pipe L will fall directly into the outlet-pipe K unless deflected from this course. The water-shed D is preferably made of thin metal in the shape shown in Fig. 2, part of the periphery being of less radius than the rest, so as to form one or more shoulders d', and the arrangement is such, as will readily be understood from Fig. 2, that the stream from the mouth of the inlet-pipe L will fall either into the outlet-pipe K or upon the water-shed D, according to the position of said water-shed axially. At the bottom of the water-shed D is the float D′ within the cup C, and the water-shed is provided with a hole d at the lowest point thereof, so as to allow the water that falls upon the water-shed to flow out into the inner cup C. This inner cup C has an outlet c near the top, through which the inner cup overflows into the outer cup B, the water being thus kept constantly in the inner cup up to the level of the outlet being sufficient to raise the float D′, thus buoying up the water-shed and raising the spindle-rod E from frictional contact with the lower bearing e'.

The mechanism supported by the base A is placed in one of the apartments to be heated. The upper frame, containing the sensitive coil G, is moved around the pivot f into such a position with reference to the lower stationary frame that when the temperature of the apartment rises above a certain point the fine stream of water flowing constantly from the inlet-pipe L will fall, unimpeded by the water-shed, directly into the outlet-pipe K; but when the temperature drops below a certain point, the movement of the sensitive coil will cause the water-shed D to move around, so that it intercepts or deflects the stream, cutting it off from the pipe K and causing it to flow down the water-shed and out through the opening d into the cup C. This cup will then overflow through its outlet c into the cup B, from which the water will then flow out through the outlet-pipe M. It will thus be seen that through the action of the sensitive coil a stream of water flows alternately through the outlet-pipe K and the outlet-pipe M, according to the temperature of the apartment.

Passing now to the apparatus which directly operates the damper or dampers through the agency of the stream of water delivered through the outlet-pipes K and M, I have shown this apparatus in Fig. 1 as applied to a common form of check-damper in the chimney-flue of a furnace.

S is the damper adapted to close the opening in the casing Q′ of the flue-pipe Q. This damper is fulcrumed on the pin or rod t, which turns with the damper, and to which is rigidly connected the two arms T T′. Of these the arm T′ has the weight W, while the arm T supports the vessel R, the weight W being sufficient to preponderate over the weight of the vessel R when empty and close the damper S. When, however, the vessel R contains a certain quantity of water, the weight of vessel and water will overbalance the weight W, and the damper S will open. The outlet-pipe K terminates at such a point that the water flowing out therefrom pours into the vessel R. The vessel R is provided with a siphon r so arranged that when the water in the vessel rises above the bend of the siphon the vessel is quickly emptied. The vessel R has also a small outlet-opening r' at such a height that the inflowing water entering the vessel when in its uppermost position (indicated by the dotted lines in Fig. 1) will be sufficient to overbalance the weight W and open the damper before the water begins to flow out of the vessel through the opening r'. This opening r' is considerably below the bend in the siphon r.

N is a stationary vessel provided with a siphon n for emptying the same when the water therein reaches the bend in the siphon. The outlet-pipe M discharges into this vessel N, and the siphon n is so placed as to discharge the contents of the vessel N into the movable vessel R when the latter is in its lowest position, (indicated by the full lines in Fig. 1.) The siphon n is of comparatively large size, so as to quickly empty the contents of the vessel N into the vessel R, the said contents being sufficient to raise the level of water in the vessel R above the bend in the siphon r and thus empty said vessel R.

P is a receptacle situated under the vessels and adapted to receive the waste water therefrom.

The operation of the apparatus will now be explained as a whole, starting with the damper S closed and the vessel R empty and in its uppermost position, (indicated by the dotted lines in Fig. 1.) Any increase in the temperature of the apartment above a certain point will cause the compound helical coil G to expand by heat, and thus move the water-shed D into such a position that the stream of water from the inlet-pipe L falls directly into the outlet-pipe K, and thence down and into the vessel R, which it slowly fills until the water has accumulated therein sufficiently to overbalance the weight W, when the vessel moves downward and the damper S opens, thus checking the draft. The fine stream from the pipe K continues to flow into the vessel R until deflected by the water-shed D, the water flowing out through the small opening r' in the vessel R as fast as it flows in after that height has been reached. As the temperature in the apartment is reduced by reason of the checking of the fire or from any other cause the helical coil G contracts and moves the water-shed D in an opposite direction until, when a certain temperature has been reached in the descending scale, the said water-shed is in position (shown in Fig. 2) to deflect the inflowing stream of water from the pipe K and cause it to flow down the water-shed through the hole d, whence it drops into the cup C, overflows through the opening c into the cup B, and finally flows down the outlet-pipe M into the stationary vessel N. This flow continues until the level of the water in the vessel N rises above the bend in the siphon n, which causes the contents of said vessel N to overflow through the siphon into the vessel R with considerable force and velocity, and the size of the siphon n being considerably larger than that of the outlet-opening r' in the vessel R the contents of the vessel N will flow into the vessel R much more rapidly than it will flow out through the small opening r', the result being that the level of the water in the vessel R, already up to said opening r', will by the additional supply from the siphon n be raised above the bend of the siphon r and empty the vessel N into the receptacle P. This will cause the weight W to act upon the damper S and close it, moving the empty vessel R upward into the position indicated by the dotted lines. The water preferably flows continually through the inlet-pipe L, but the stream is very fine, only a small amount of water being necessary to do the work. The water-shed operated by the sensitive coil controls by its movement the flow of the stream with reference to the two pipes K and M, according to the conditions of the temperature in the apartment. The conditions may be such that the shoulder d on the water-shed may be directly under the center of the mouth of the inlet-pipe L, in which case the stream falling therefrom will be only partly deflected, part of said stream falling into the outlet-pipe K and part flowing through the roundabout path to the outlet-pipe M. The height of the outlet-opening c from the inner cup C determines the amount of water kept constantly in the cup C to buoy up the float D′ of the water-shed. In this manner the friction of the lower bearing e' against the spindle-rod E may be reduced to almost nothing, the friction being thus transferred from the lower bearing e' to the upper bearing e, thus making the rotative movement of the water-shed by means of the sensitive coil through the gears I I′ more certain and delicate. Such an apparatus works with the utmost delicacy in controlling the damper or dampers of a heater.

The temperature of an apartment may be kept nearly constant at any desired point by moving the upper frame F^2 F^3, with reference to the lower frame F F′, into such a position that at the desired temperature one of the shoulders d' of the water-shed is directly under the mouth of the inlet-pipe L.

I do not confine myself to any particular form of sensitive actuating device for moving the water-shed by changes of temperature. The said actuating device I term a "thermal motor," because it acts by changes in temperature to give movement to the water-shed. This thermal motor may consist of a compound coil, as just described, or a column of mercury, or a simple metallic rod, or anything susceptible to changes in temperature and arranged to move a water-shed.

In Figs. 3 and 4 I have shown a simpler form of apparatus to be placed in the apartment, in which I employ for a thermal motor G a compound strip made up of two unequally-expansible materials joined together, such as metal and hard rubber, the said strip being confined at one end, while the free end moves sidewise through changes in temperature. The inner end of this compound strip is confined in a piece arranged to be turned by means of the knob or handle G′. The outer or free end of the strip is provided with the extension E′, on which is mounted the water-shed D, which in this case consists of a plain plate or disk held at an angle on the piece E′, as shown in Fig. 3, in such a manner that it may cover the outlet-pipe K at a certain temperature and deflect the stream from the inlet-pipe L, (which stream, unless interrupted, would fall directly into and through the outlet-pipe K,) causing it to flow into the cup B, and thence out through the outlet-pipe M. The knob or handle G′ has in this case a finger or indicator g, which traverses a stationary graduated scale g', so that the apparatus may be set to act at any given temperature. When it is desired to cut off the flow through the outlet-pipe K and cause the water to flow through the outlet-pipe M at a given temperature, the sensitive strip is so set that at that temperature the water-shed D will be in the position indicated in Fig. 4—*i. e.*, directly under said inlet-pipe L. A fall in temperature would cause the free end of the compound strip G to move laterally, carrying the water-shed D out from under the mouth of the inlet-pipe L and allowing the stream to flow through the outlet-pipe K.

The adjustability of the apparatus is an important feature whereby the damper may be caused to move at any desired temperature. In this manner the apartments may be kept, for instance, at a temperature of 70° in the day-time and 60° at night, the thermal coil being so sensitive as to cause the check-damper, in the first case, for example, to open whenever the temperature of the apartment rises to 70½°, this acting to check the fire and to cause the damper to close whenever the temperature falls to 69½°, thus acting to make the fire hotter.

Of course the arrangement of dampers is immaterial, as several may, if desired, be so connected together as to operate at once.

It will be observed that by using one outlet-pipe and allowing the water to go to waste when not flowing into the same and by using a stream large enough the damper could be opened by that stream when flowing into the same and closed when allowing the water to go to waste by providing a leak in the damper-operating vessel, which, when emptied, would be overbalanced by a counter-weight.

The same mechanism as above described for the operation of dampers is equally applicable for opening and closing a valve, as in steam-heating, or a register or ventilator in a room.

I claim—

1. In a heat-regulating apparatus, the combination of an inlet water-pipe, two outlet water-pipes, a thermal motor, a water-shed operated by said thermal motor, whereby the stream of water from the inlet-pipe is allowed to flow through one or the other of said outlet-pipes, and damper-operating vessels arranged to receive water from the outlet-pipes, substantially as described.

2. In a heat-regulating apparatus, the combination of an inlet water-pipe L, two damper-operating outlet water-pipes K and M, a sensitive coil G, a suitably-mounted spindle-rod E, provided with a stream-controlling water-shed D, fixed thereon, said rod being rotatively movable through gears by said coil, and damper or valve operating vessels arranged to receive water from the outlet-pipes, all arranged and operating substantially as described.

3. In a heat-regulating apparatus, the combination of a sensitive coil, a gear-wheel secured thereto, a spindle-rod loosely mounted in upper and lower bearings and provided with a pinion engaging with said gear-wheel, a stream-controlling water-shed and float mounted on said spindle-rod, and a float-supporting cup of water, whereby the friction is removed from the lower bearing of the spindle-rod and transferred to the upper, substantially as and for the purposes described.

4. In a heat-regulating apparatus, the combination of an inlet water-pipe, two damper-operating outlet water-pipes, a sensitive coil, a stream-deflecting water-shed rotatively movable through gears by said coil, a stationary lower frame containing said water-shed and pipes, and a movable upper frame containing said coil, all arranged and operating substantially as described.

5. The combination of a water-pipe, a receptacle for receiving the water, arranged as a damper or valve operating weight, a water-shed, and a thermal motor arranged to shift the water-shed, whereby the water is directed into or diverted from said receptacle, substantially as described.

In witness whereof I have hereunto set my hand.

GEO. L. SHOREY.

Witnesses:
WM. B. H. DOWSE,
ALBERT E. LEACH.