No. 613,062. Patented Oct. 25, 1898.

W. E. FACER.

THERMOSTAT.

(Application filed Nov. 4, 1897.)

(No Model.)

Fig. 1.

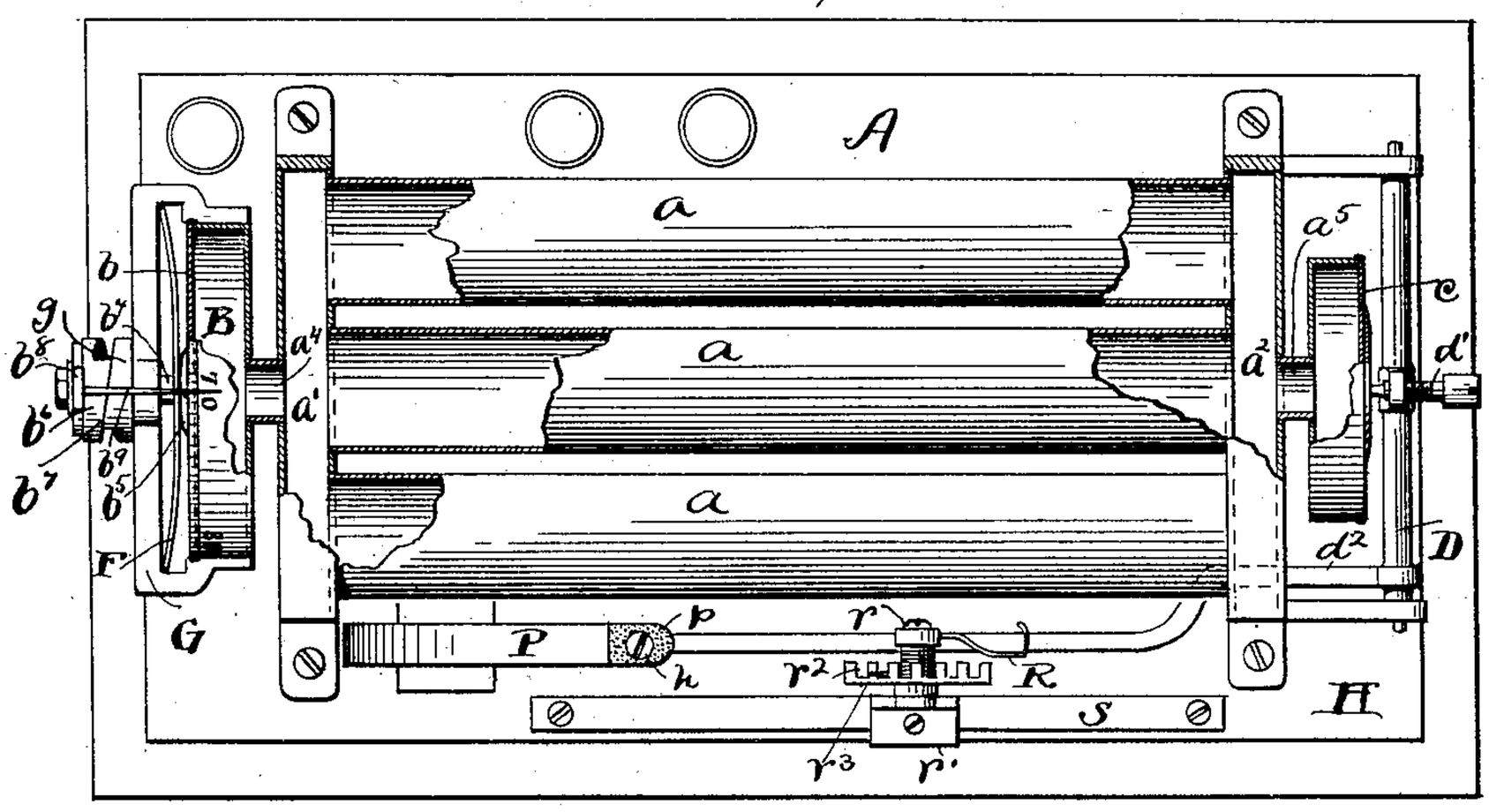


Fig. 2.

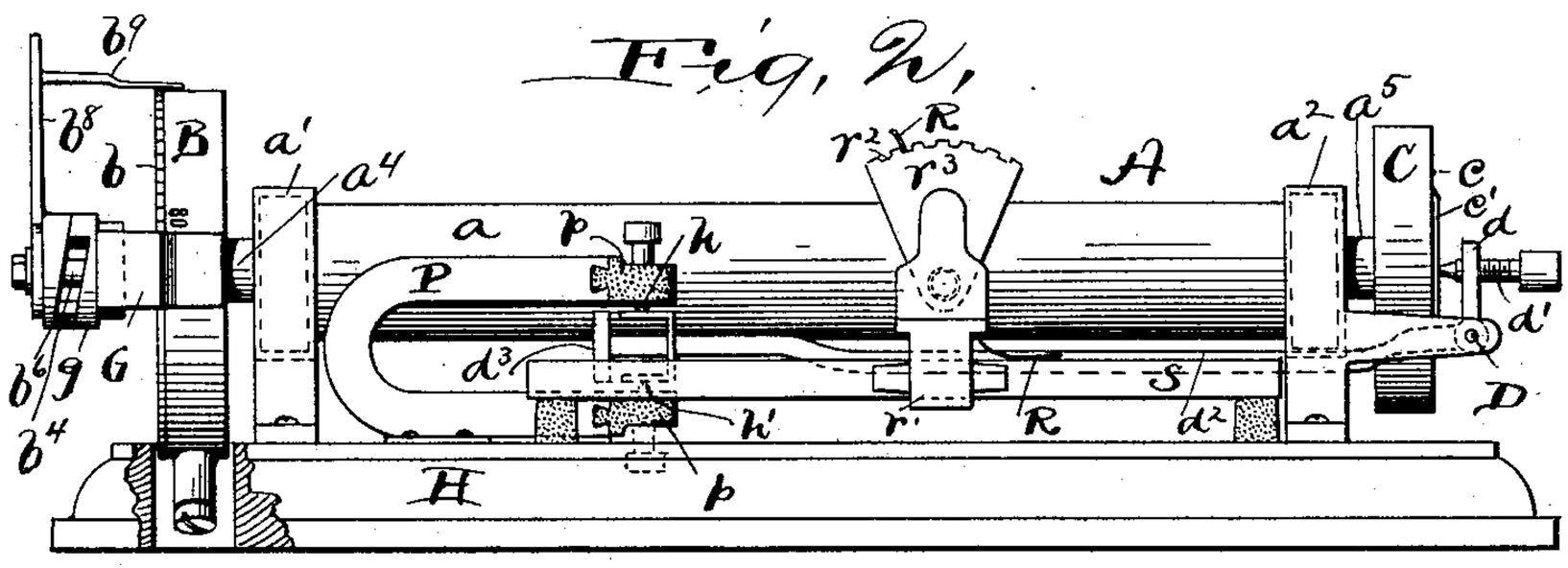


Fig. 3.

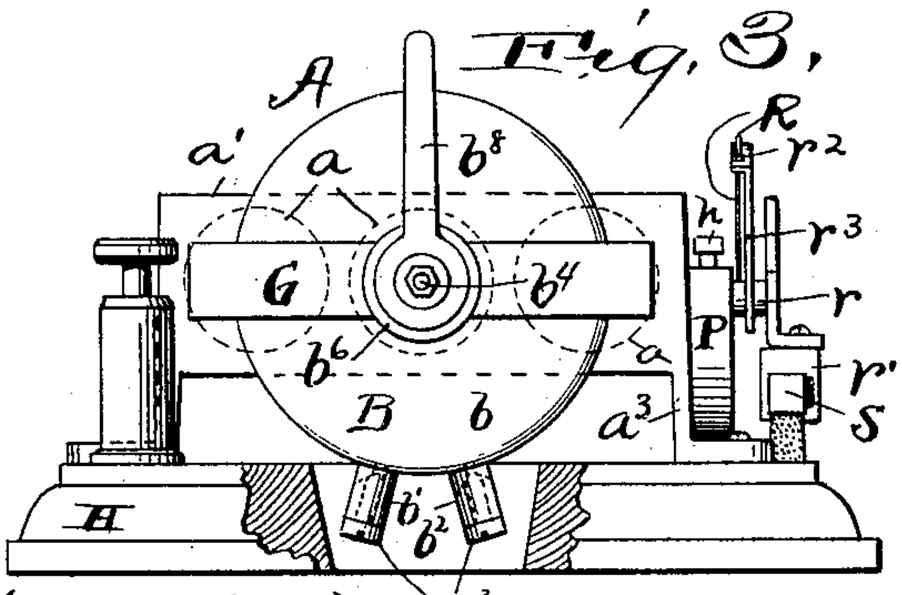
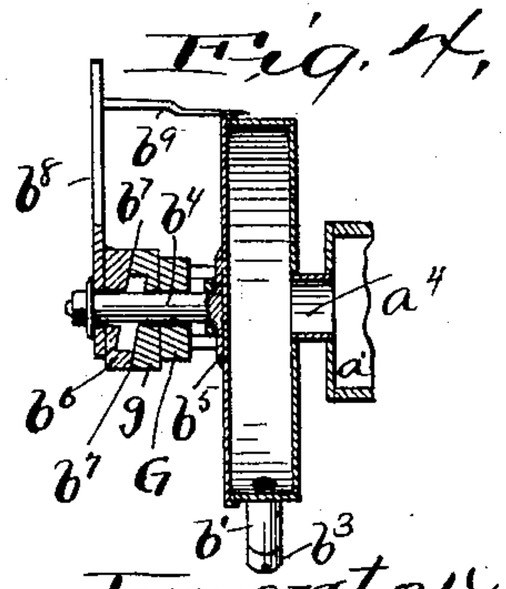


Fig. 4.



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Inventor,
Wilson E. Facer,
By his Attorneys,
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UNITED STATES PATENT OFFICE.

WILSON E. FACER, OF CLEVELAND, OHIO, ASSIGNOR OF ONE-HALF TO CHARLES H. TUCKER, OF SAME PLACE.

THERMOSTAT.

SPECIFICATION forming part of Letters Patent No. 613,062, dated October 25, 1898.

Application filed November 4, 1897. Serial No. 657,447. (No model.)

To all whom it may concern:

Be it known that I, WILSON E. FACER, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Thermostats, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

The object of my invention is to provide a very sensitive thermostat which will be responsive to slight changes in temperature within the limits for which it is specially adapted.

The invention consists in the construction and combination of parts hereinafter described, and pointed out definitely in the claims.

In the drawings, Figure 1 is a plan view, partly in section, of my improved thermostat. Fig. 2 is a side elevation thereof. Fig. 3 is an end elevation, and Fig. 4 is a central vertical sectional view through the end of the device which is shown in Fig. 3.

Referring to the parts by letters, A represents a receptacle or container which is made of material which will conduct heat quickly to and from the contained liquid—as, for example, thin copper or brass. This container is fixed to a suitable support in proper relation to the mechanism which is to be directly acted upon by the expansion and contraction of the inclosed liquid. This receptacle has two flexible diaphragms *b* and *c*, which form parts of its wall. The former is to be moved by suitable mechanism outward or inward to enlarge or diminish the capacity of the receptacle, while the other diaphragm, which moves outward or inward as the inclosed liquid expands or contracts, is designed to positively operate certain mechanism which indirectly causes a change of the temperature of the surrounding air.

The drawings show the best construction for the receptacle which is now known to me. It consists of three parallel thin copper tubes *a*, the ends of which are secured in the adjacent walls of two hollow heads a' a^2. Each of these heads has two legs a^3, which are secured to a supporting-board H. Two hollow drums B and C are connected, respectively, to the heads a' a^2 by hollow tubes a^4 a^5. The outer walls *b* and *c* of each of the hollow drums B and C are flexible, being made of very thin metal. All of the joints between the parts of the receptacle must be tight, so as to prevent the escape of the inclosed liquid. The receptacle is to be filled with an expansible liquid, and for this purpose I prefer sulfuric ether. It may be filled through either of two openings b' b^2 in drum B, the other opening being for the escape of air. When the receptacle is filled, the two openings are closed, preferably by screw-valves b^3 b^3.

A yoke G is secured to the drum B. A rod b^4, having a head b^5, is soldered or otherwise fastened to the center of disk *b*, and it extends horizontally through yoke G. On the outer face of the yoke a cam *g* is fastened, surrounding the rod b^4. A collar b^6, which is loosely mounted on the rod b^4, has a cam-face b^7, which engages with cam *g*, whereby the disk *b* may be positively drawn outward, with the result of enlarging the capacity of the receptacle. Secured to the collar b^6 is an arm b^8, having a spring-pointer b^9, which bears upon the rim of the drum B with enough friction to hold the collar stationary. The rim of this drum is graduated with degrees of temperature between which the device is adapted to work, (in the present case between 60° and 80°.) The spring-pointer may be set by means of these graduations so that the device will work at the desired temperature. For example, when by the turning of collar b^6 the capacity of the receptacle is enlarged the other flexible disk *c* will be moved outward far enough to operate the circuit-closer at a higher degree than it otherwise would be, and vice versa. A spring F, which lies between the disk *b* and yoke G, acts to move said disk inward to reduce the capacity of the receptacle. This spring will yield when the pressure in the receptacle becomes too great, and thus prevent any accident to the device. The movement of disk *c* is intended to move a circuit-breaker, which, as shown, is constructed as follows:

A vertical lever-arm *d*, secured to a rock-shaft D, has an adjustable screw d', which bears against a button c', which is secured to said disk. Another arm d^2, which stands in

a horizontal direction, is secured to the rock-shaft D, and its end lies between two adjustable contact-points h h', preferably screws. When by the expansion of the contained fluid the disk c is moved outward, it acts upon the lever-arm d and causes the lever-arm d^2 to be moved upward into contact with the upper point h. This point is the terminal of an electric circuit, the lever d being the other terminal. When these two are in contact, a circuit is completed, and thereby some mechanism (not shown) is set into motion which causes a lowering of the temperature. The lever-arm d^2 is moved in the contrary direction when by the contraction of the liquid the disk is drawn inward, whereby it comes into contact with the other point h'. This completes another electrical circuit, of which said point h' and the lever-arm d^2 are the terminals, whereby mechanism is caused to operate to raise the temperature. These contact-points h h' are adjustable through blocks of insulation p on the ends of the legs of a horseshoe permanent magnet P. On the lever-arm d^2 an armature d^3 is fastened between the legs of said magnet. The action of the magnet on the armature causes the lever to move rapidly when it has been moved more than half-way by the other mechanism described.

The lever-arm d^2 is moved up by the expansion of the disk c, and it is moved in the contrary direction by a spring R. This spring is coiled about a pin r on a block r', which slides on a fixed bar S. One end of this spring is adapted to enter either of a series of notches r^2 in a segment r^3, which is rigid with said block, whereby the spring R is placed under greater or less tension and the block r' may be moved along the bar S to change the leverage of the spring upon the lever-arm.

The apparatus described will act with great delicacy—so great that a change of temperature of half a degree will almost instantaneously cause the movement of the lever-arm from one contact-pin to the other.

Having described my invention, I claim—

1. In a thermostat, in combination, a thin metal receptacle filled with an expansible liquid, and having two flexible disks forming parts of its wall, a yoke fixed to said receptacle and extending in front of one disk, a pin secured to said disk, and mechanism acting upon said pin to draw the disk outward, a spring between the yoke and disk and acting to press said disk inward, and a circuit-breaking device in contact with and adapted to be operated by the other flexible disk, substantially as specified.

2. In a thermostat, in combination, a thin metal receptacle filled with an expansible liquid, and having two flexible disks forming parts of its wall, a yoke secured to the receptacle and extending in front of one of said disks, a pin secured to the disk and passing through said yoke, said pin having a head upon its outer end, a cam secured to the yoke, a collar upon the pin having a cam adapted to engage with the cam on the yoke, and a spring between the yoke and disk, and a circuit-breaking device in contact with and adapted to be operated by the other disk, substantially as specified.

3. In a thermostat, in combination, a receptacle made of thin metal filled with an expansible liquid and having at its ends respectively two drums which form a part of said receptacle, each drum having for its outer end a flexible disk, a yoke secured to one of said drums and extending in front of its disk, a pin secured to the disk and passing through said yoke, a cam on the yoke, a collar loosely mounted on the pin and having a cam which engages with the cam on the yoke, an arm secured to said collar, and a spring-pointer secured to the arm engaging with the periphery of said drum, which periphery is graduated to indicate degrees of temperature, and a circuit-breaker in contact with and adapted to be operated by the disk which forms a part of the other drum, substantially as specified.

4. In a thermostat, in combination, a thin metal receptacle containing an expansible fluid and having two flexible disks in and forming parts of its wall, mechanism for drawing one of said disks outward to enlarge the capacity of the receptacle, and a spring pressing said disk in the contrary direction, a circuit-breaker consisting of the two pivoted lever-arms d d^2, the latter of which forms one terminal of two electric circuits, insulated screw-points on opposite sides of said lever, which respectively form the terminals of said two electric circuits, substantially as specified.

5. In a thermostat, in combination, a thin metal receptacle containing an expansible fluid and having two flexible disks in and forming parts of its wall, mechanism for drawing one of said disks outward to enlarge the capacity of the receptacle, and a spring pressing said disk in the contrary direction, a circuit-breaker consisting of the two pivoted lever-arms d d^2, the latter of which forms one terminal of two electric circuits, a fixed horseshoe-magnet between the legs of which the lever-arm d^2 projects, blocks of insulation secured to the ends of the legs of said horseshoe-magnet, an armature on said lever between said legs, and screws adjustable through said blocks of insulation, which screws are respectively the terminals of said two electrical circuits, substantially as specified.

6. In a thermostat, in combination, a receptacle consisting of two hollow heads, thin metal tubes extending between and set into said heads, two drums secured respectively to the outer walls of said heads and in open communication therewith, two flexible disks forming respectively the outer walls of said drums, mechanism for positively drawing one of said disks outward to enlarge the capacity of the receptacle, a spring acting to force said

disk in the contrary direction, and a circuit-breaking device in contact with and adapted to be operated by the other flexible disk, substantially as specified.

7. In a thermostat, in combination, a thin metal receptacle containing an expansible liquid and having two flexible disks which form parts of its wall, means for positively drawing one of said disks outward to enlarge the capacity of the receptacle, a spring acting in the contrary direction upon said disk, the connected pivoted lever-arms d d^2, an adjustable screw which passes through one of said lever-arms and is in contact with the other flexible disk, the fixed bar S, sliding block thereon, and the adjustable spring carried by said block and operating upon the lever-arm d^2, substantially as specified.

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

WILSON E. FACER.

Witnesses:
E. L. THURSTON,
ALBERT H. BATES.