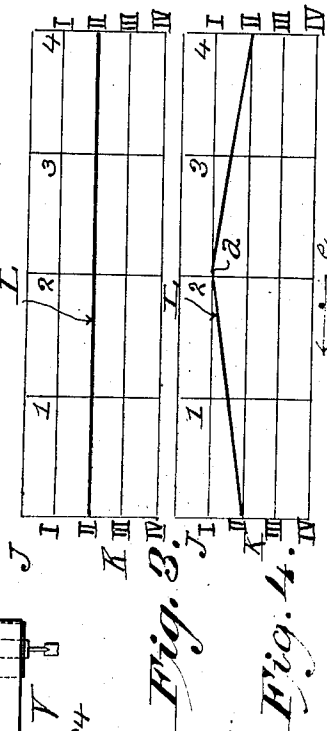
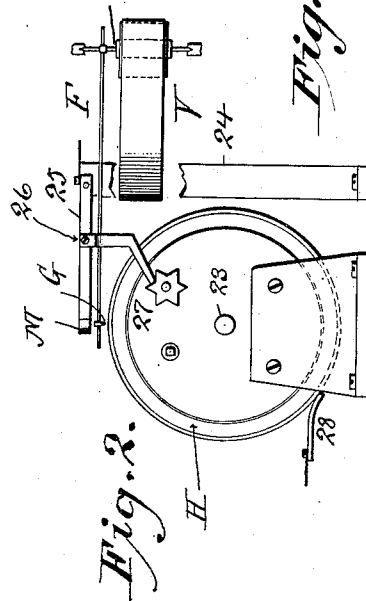
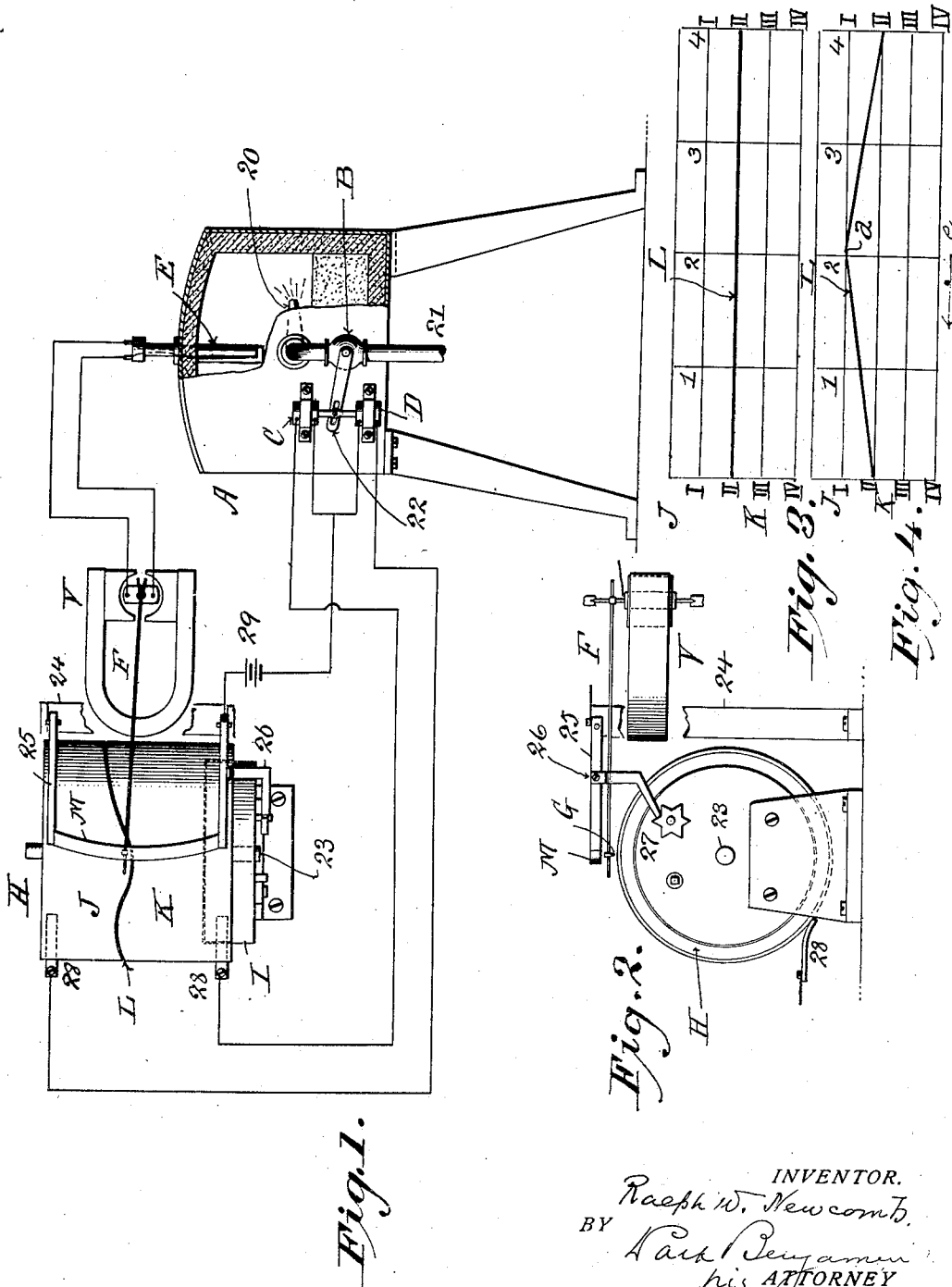


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 APPARATUS FOR CAUSING A PREDETERMINED VARIATION OR PREDETERMINED VARIATIONS IN
 A PHYSICAL EFFECT.

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1,295,572.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, RALPH W. NEWCOMB, a citizen of the United States, residing at Greenwich, in the county of Fairfield and State of Connecticut, have invented a certain new and useful Improvement in Apparatus for Causing a Predetermined Variation or Predetermined Variations in a Physical Effect, of which the following is a specification.

The invention is an apparatus for causing a predetermined variation, or predetermined variations, in a physical effect—such as heat, light, sound or electricity—at a given period, or periods, in a predetermined interval of time, which apparatus is itself controlled by a variation, or variations, automatically occurring in said effect.

I herein illustrate my invention in an apparatus for controlling temperature in a furnace, whereby said temperature may be caused to change at a certain period or be caused to make a plurality of changes in a predetermined time interval.

In the accompanying drawings—

Figure 1 is a general view of my apparatus, the electrical connections being shown diagrammatically. Fig. 2 is an end elevation of the rotary drum and a side elevation of the voltmeter stylus and stylus depressing bar. Figs. 3 and 4 are temperature-time diagrams explanatory of my invention.

Similar letters and numbers of reference indicate like parts.

A is a furnace of any suitable construction which is heated by a gas burner 20 entering the fire chamber and supplied by duct 21. In said duct is a rotary or faucet valve B operated by slotted lever 22. Supported in brackets on the furnace wall are oppositely disposed electro-magnets C, D, the movable cores of which are connected to a pin sliding in the slot of lever 22. When magnet C is energized, the valve B is rotated to reduce fuel supply to burner 20, and when magnet D is energized, valve B is rotated to increase said supply. In this way the temperature of the furnace is here reduced or increased, as the case may be.

Within the fire chamber is a thermopile E, the terminals of which are connected to the moving coil of a voltmeter V of the D'Arsonval or Weston type having a stylus F, on the under side of which is a contact pin G.

H is a drum continuously rotated at selected speed by any suitable means, such as a clockwork mechanism I, geared to the drum shaft 23. The drum comprises two mutually insulated metal plates J, K in cylindrical form separated by an electrical gap, here a strip L of insulating material, the surface of which is flush with the plate surfaces.

Pivoted at their ends in a support 24 are arms 25 connected by a curved bar M which extends over the stylus F. On one of said arms is an arm 26 which extends over a toothed wheel 27 rotated by the clockwork mechanism I. As each tooth of said wheel passes under arm 26, said bar M is raised and released so that it falls upon stylus F, and so intermittently depresses pin G into contact with said drum.

Bearing against the drum cylinders J, K are spring contacts 28, respectively connected to a terminal of each of the magnets C, D. The opposite terminals of said magnets are jointly connected to battery 29, which in turn is connected to one of the arms 25.

The stylus F with its pin G is a switch which is moved by the voltmeter across the cylinders J, K and strip L. When said switch contacts with cylinder K, circuit is established to magnet C, which closes valve B to reduce fuel supply to the furnace, and when said switch contacts with cylinder J, circuit is established to magnet D to increase said fuel supply.

In Fig. 3 let the parallelogram shown represent cylinders J, K developed in a plane as flat plates. Let the electrical gap formed by insulating strip L be a straight line parallel to a long side of the parallelogram, and assume said side to be laid off in equal scale divisions 1, 2, 3, 4, representing time, as hours, and a short side to be laid off in equal scale divisions I, II, III, IV, representing temperatures increasing from I to IV. If the stylus pin G be placed on strip L and the parallelogram be moved in the direction of the arrow e, Fig. 4, at a constant speed, then as the temperature of the furnace increases, the stylus or switch will move away from strip L and will make contact with one of said cylinders, and if the temperature falls it will move away from strip L in the opposite direction and make contact with the other of said cylinders; so that the effect will

be to keep the furnace at uniform temperature during the predetermined time interval. Now the object of my invention is to provide not for uniform temperature, but for a predetermined change, or changes, in temperature during said interval. Thus, to illustrate, and referring to Fig. 4, suppose we desire the temperature of the furnace starting from temperature II and hour zero to be reduced at the hour 2 from II to I. Therefore we have a time vector 2, and a temperature vector II, I, and the resultant vector is the line II α . In the following two hours, the temperature vector is I, II, the time vector is 2—4, and the resultant vector is a II. Therefore the insulating strip L is given the form of the bent line II α II, which is here formed by the two successive resultant vectors, with which line the edges of the adjacent cylinders J, K may be made to conform.

Now supposing the switch to be at temperature II and hour zero and the drum H to start rotating in the direction of arrow e , the switch will then make contact with cylinder K, closing circuit to magnet C. The temperature in the furnace will then be reduced, and affect the thermopile and voltmeter to move the switch toward the strip L, upon reaching which the circuit is interrupted, and in like manner whenever the strip runs from under the switch, circuit will be established to magnet C or magnet D, which in turn will operate valve B, vary the fuel supply, and hence the current given by the thermopile, and so cause the voltmeter to bring the switch pin G again on the insulating strip L. In other words, the switch follows the electrical gap or insulating strip L. That gap is in the line or form of the resultant vector of the two selected component vectors, time and temperature. All that is necessary is to make the strip L represent any selected relation of two vectors, and the physical effect controlled by the switch will be governed in accordance with that relation.

If the physical effect is always to be controlled in the same way, then a single drum constructed, as described, to accomplish the desired variations may be installed once for

all. If, on the other hand, the apparatus is to control the physical effect in different ways, then other drums differing in the shape of the strip L will be provided and be substituted for the first drum whenever the change is required. A single operating apparatus may thus be provided with an indefinite number of drums, each capable of differently regulating the physical effect, and analogous to the different record cylinders of a phonograph.

By suitably shaping the strip L, I may make as many changes in time-temperature within the predetermined time interval as may be desired, or render said changes gradual or abrupt.

I claim:

An apparatus for causing a predetermined variation in a physical effect at a certain period during each of a succession of predetermined time intervals, comprising a pair of contacts, a switch actuated by said physical effect to follow an electrical gap between the edges of the members of said pair of contacts, the said members being in tubular form, which gap developed on a plane is in the form of the line of the resultant vector of component vectors respectively representing units of said physical effect and units of time, means for rotating said members at a predetermined speed, means for increasing said physical effect, and means for decreasing said physical effect, the said increasing and decreasing means being respectively in circuit with the members of said pair of contacts: whereby when one of said circuits is closed by the movement of said switch away from said gap, said physical effect is increased, and when the other of said circuits is closed by the movement of said switch away from said gap in the opposite direction, said physical effect is decreased.

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

RALPH W. NEWCOMB.

Witnesses:

GERTRUDE T. PORTER,
MAY T. MCGARRY.