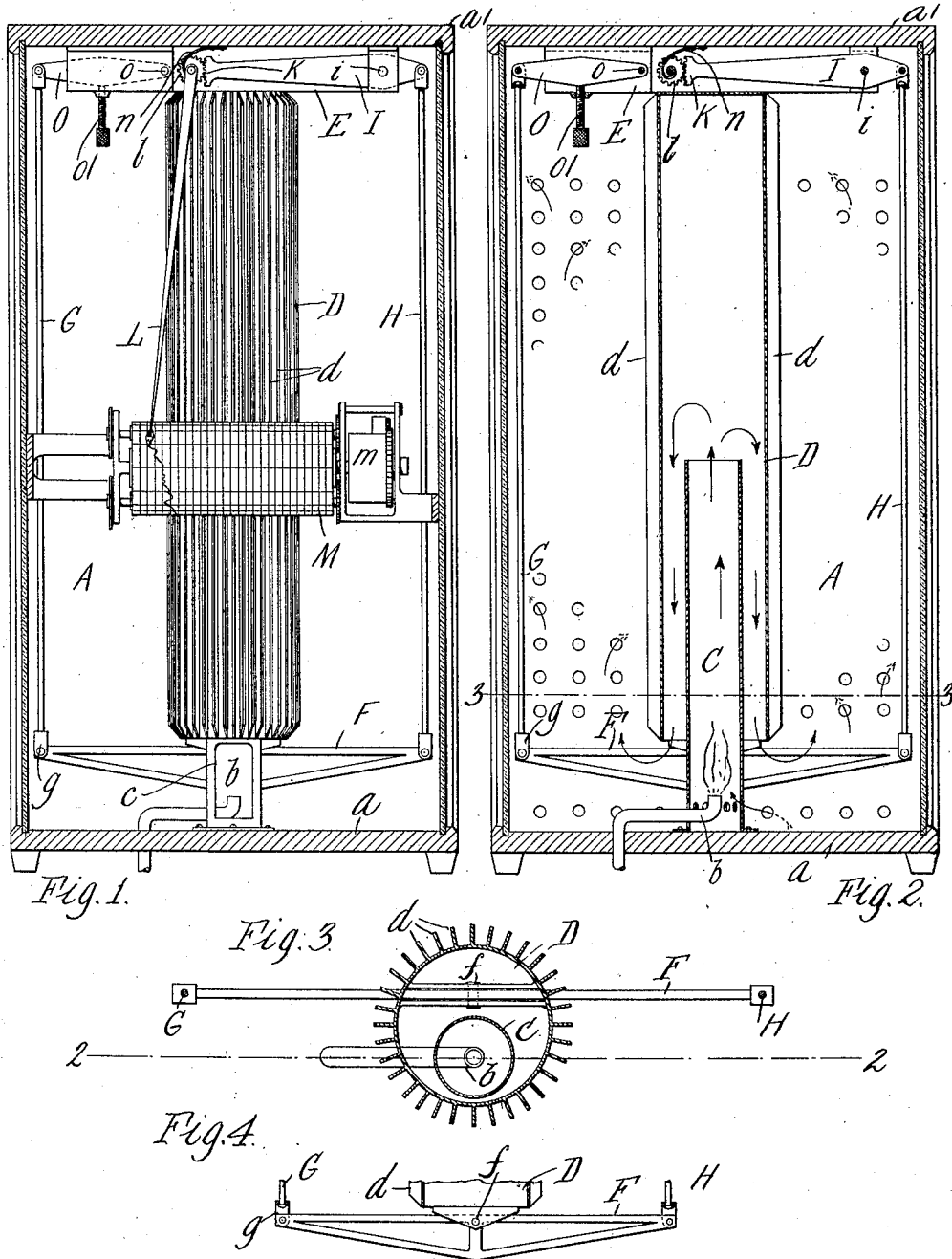


F. A. STAMPS.
GAS CALORIMETER.
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Patented Apr. 8, 1913.



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GAS-CALORIMETER.

1,058,483.

Specification of Letters Patent.

Patented Apr. 8, 1913.

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To all whom it may concern:

Be it known that I, FREDERICK A. STAMPS, a subject of the King of Great Britain, residing at Niagara Falls, in the county of Niagara and State of New York, have invented a new and useful Improvement in Gas-Calorimeters, of which the following is a specification.

This invention relates to that class of gas calorimeters which comprise a chamber in which the gas is burned and mechanism by which the heat generated by the combustion of the gas is indicated or recorded, the gas being supplied to the burner at a uniform rate and the apparatus being otherwise so constructed that the heat generated by the burning gas varies only in accordance with the constituents or heating value of the gas while other factors are constant.

The object of this invention is to produce a simple and reliable calorimeter of this general character in which the gas is burned in a chamber which receives the hot gaseous products of combustion and which is provided with mechanical means which respond by expansion and contraction in variations in the temperature of these gaseous products.

In the accompanying drawing Figure 1 is a sectional front elevation of this improved calorimeter. Fig. 2 is a similar view with the section taken on line 2-2, Fig. 3. Fig. 3 is a horizontal section on line 3-3, Fig. 2, with the casing omitted. Fig. 4 is a sectional elevation of the lower end of the heating chamber and connecting parts.

Like reference characters refer to like parts in the several figures.

A represents the casing of the apparatus having a bottom *a* and a top plate *a'*.

b represents the gas burner which is arranged in the casing above the bottom and to which gas is supplied at a uniform rate in any suitable or well-known manner. This gas burner is arranged in the lower portion of a chimney or combustion chamber *C* which is secured to the bottom *a* and extends upwardly therefrom to a point about half way the height of the apparatus where it opens into a surrounding heating and radiating chamber *D* which is closed at the top and open at the bottom. The hot products of combustion rise from the burner through the chimney *C*, pass from the upper end of the latter into the heating cham-

ber *D*, pass downwardly through the space between the chimney and the heating chamber, pass from the lower end of the latter into the casing, and escape from the casing by any suitable means, for instance through holes in the back of the casing, as indicated by the arrows in Fig. 2.

The heating and radiating chamber *D* is suspended in the casing *A* in any suitable manner, preferably by being attached at its closed upper end to a cross bar or plate *E* which is secured to the under side of the top plate *a'*. The upper end of the chamber *D* being fixed in this manner, the lower end of the chamber moves down and up as the chamber expands or contracts under variations in the temperature of the gaseous products of combustion.

The lower end of the chamber *D* is provided with a horizontal multiplying lever *F* which is pivotally connected at *f* with the lower end of the chamber and which has its ends connected with upright compensating rods or bars *G* *H*, respectively. The rod *G* is fixed or stationary, except that it is vertically adjustable, and its lower end *g* forms the fulcrum on which the lever *F* rocks vertically. The bar *H* connects with the free end of the lever and is moved down or up by the same as the chamber *D* expands or contracts and is connected at its upper end with the indicating or recording mechanism.

The compensating rods *G* and *H* are preferably made of the same material as the heating chamber *D*, aluminum, zinc or any metal or alloy having a high coefficient of expansion being preferably used, so that the chamber and these rods expand and contract alike under variations in the temperature of the air. This causes the lower ends of the two rods and of the chamber to move down or up to the same extent as they expand or contract under variations in temperature which affect all three of these parts alike, for instance variations in the air temperature, and this prevents such changes from actuating the indicating or recording mechanism.

The expansion or contraction of the heating chamber *D* resulting from variations in the heat of the gaseous products of combustion causes the lever *F* to move down or up on the lower end of the rod *G* as a fulcrum and this movement of the lower end of the chamber is doubled in extent at

the free end of the lever, and so communicated to the rod H, the chamber being connected with the lever between the ends thereof. The upper end of the rod H is connected with any suitable indicating or recording mechanism, for instance, as shown, with the short arm of a horizontal lever I pivoted to the bar E at *i* and carrying at the end of its long arm a gear segment K which meshes with a pinion *l*. The spindle of this pinion carries a marker or pen L which traces a record upon a recording cylinder M rotated by a suitable clock-work *m*. The pinion is held yieldingly in its normal position by a spring *n*.

The upper end of the fulcrum rod G is preferably made vertically adjustable by any suitable means, for instance, as shown, by a horizontal lever O to which the upper end of this rod is attached and which is adjustably connected with the supporting plate E by the pivot *o* and the adjusting screw *o'*. By means of this adjusting device the parts of the mechanism can be nicely adjusted to place the marker in the proper position on the recording cylinder.

The expansion and contraction of the heating chamber resulting from variations in the temperature of the products of combustion is transmitted to the recording mechanism by the lever F and rod H and correctly recorded, while changes of temperature which affect the chamber D and the compensating rods G and H alike are not recorded.

The heating chamber is preferably so constructed as to present a large radiating surface, in order to dissipate the heat of the products of combustion as quickly as possible, for instance with upright ribs or wings *d* on its outer side, as represented in Figs. 1-4. The chimney C is preferably provided with a transparent plate or window *c*, Fig. 1, through which the flame can be observed.

In the above described construction of the apparatus the heating and radiating chamber forms the expansion member which responds to variations in the temperature of the hot products of combustion.

I claim as my invention:

1. In a gas calorimeter, the combination of a gas burner, a heating and radiating chamber through which the hot products of combustion flow from said burner and which constitutes a metallic expansion member which is acted upon by said hot products, and compensating bars having the same ratio of expansion as said member, which bars are arranged outside of said chamber and connected with said expansion member, and a fixed support for said bars, substantially as set forth.

2. A gas calorimeter comprising a gas burner, a heating and radiating chamber which receives the hot products of combustion

from the burner and which is free to expand and contract under variations of temperature of said products, compensating bars having the same ratio of expansion as said chamber and arranged outside of the same, and indicating means actuated by such variations of expansion, substantially as set forth.

3. In a gas calorimeter, the combination of a gas burner, a heating and radiating chamber which receives the hot products of combustion from said burner and which is free to expand and contract at one end, compensating bars arranged outside of said chamber, a lever connected with said bars and with the free end of said chamber, and indicating means actuated by said lever, substantially as set forth.

4. In a gas calorimeter, the combination of a gas burner, a heating and radiating chamber through which the hot products of combustion flow and which has its outer surface exposed for the radiation of heat, said chamber being free to expand and contract at one end, a lever pivotally connected between its ends with the free end of said chamber, a fulcrum support for one end of said lever, and indicating mechanism actuated by the free end of said lever, substantially as set forth.

5. In a gas calorimeter, the combination of a gas burner, a chimney in which said burner is arranged, an upright heating and radiating chamber into which said chimney opens and which surrounds the same and is separated therefrom by a passage for the hot products of combustion, said chamber having its outer side exposed for radiation and forming an expansion member which is acted upon by said hot products, and means for indicating variations in such expansion, substantially as set forth.

6. In a gas calorimeter, the combination of a gas burner, a chimney in which the same is arranged, a heating and radiating chamber which is closed at the top and into which said chimney opens, the chamber and the chimney being separated by a descending passage for the products of combustion, and said chimney forming an expansion member which is acted upon by said hot products, and means for indicating variations in such expansion, substantially as set forth.

7. In a gas calorimeter, the combination of a gas burner, a heating and radiating chamber which receives the hot products of combustion from said burner and which forms an expansion member which is acted upon by said products, a compensating fulcrum bar arranged outside of said chamber, means for adjusting said bar vertically, a multiplying lever pivoted to said bar and connected with said expansion member, a compensating bar connected with the free

end of said lever, and indicating means actuated by said last mentioned bar, substantially as set forth.

5 8. In a gas calorimeter, the combination of a gas burner, a heating and radiating chamber which receives the hot products of combustion from said burner and which forms an expansion member which is acted upon by said products, a compensating ful-
10 crum bar arranged outside of said chamber, a vertically adjustable lever by which the upper end of said bar is adjustably sup-

ported, a multiplying lever pivoted to the lower end of said bar and connected with said expansion member, a compensating bar 15 connected with the free end of said lever, and indicating means actuated by said last mentioned bar, substantially as set forth.

Witness my hand, this 9th day of November, 1911.

FREDERICK A. STAMPS.

Witnesses:

R. J. HARTIGAN,

FRED J. HALL.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."