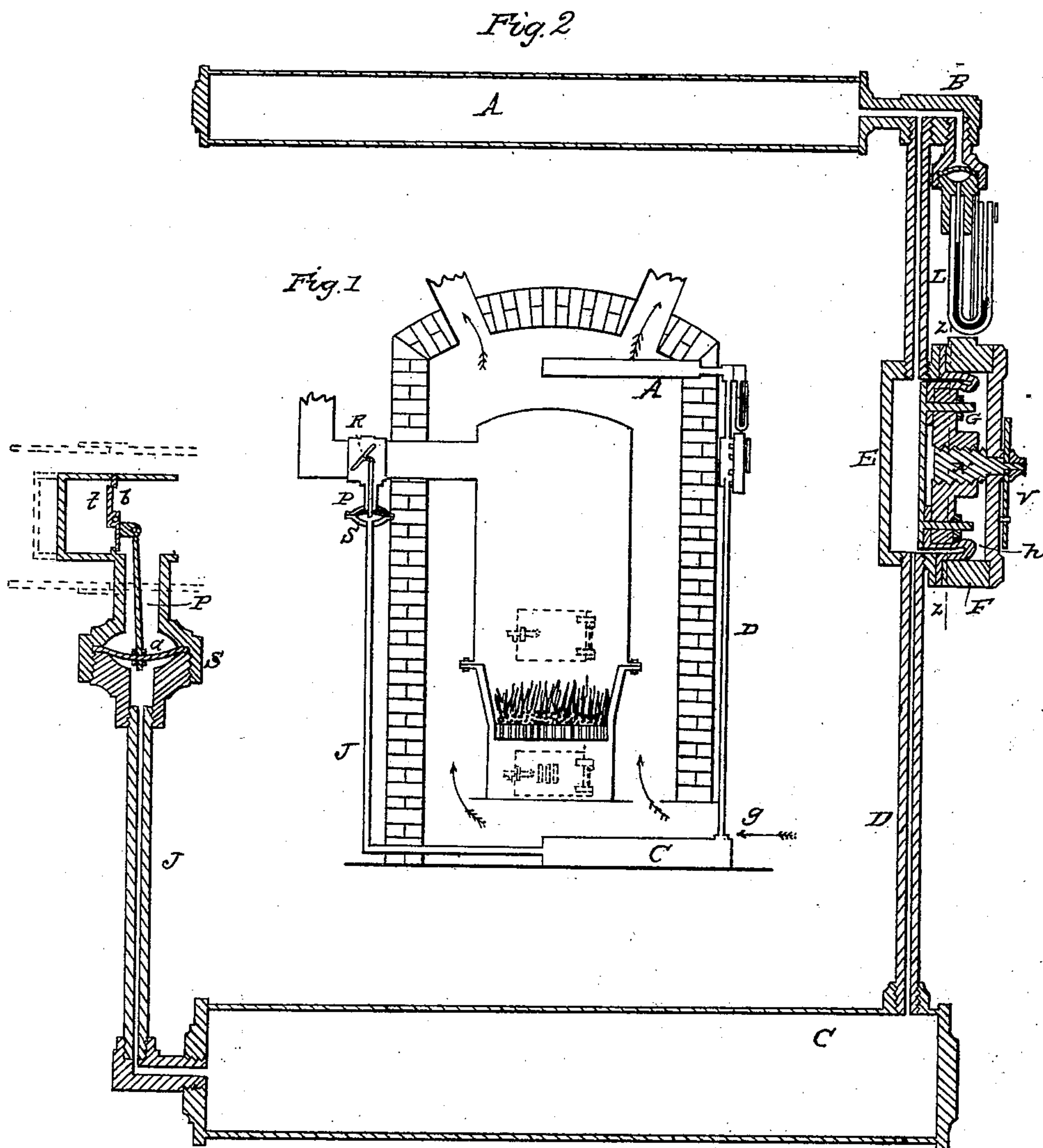


A. H. TINGLEY.
Regulator for Hot Air Furnaces.

2 Sheets—Sheet 1.

No. 59,294.

Patented Oct. 30, 1866.



WITNESSES
Benjamin Arnold
Horace N. Foster

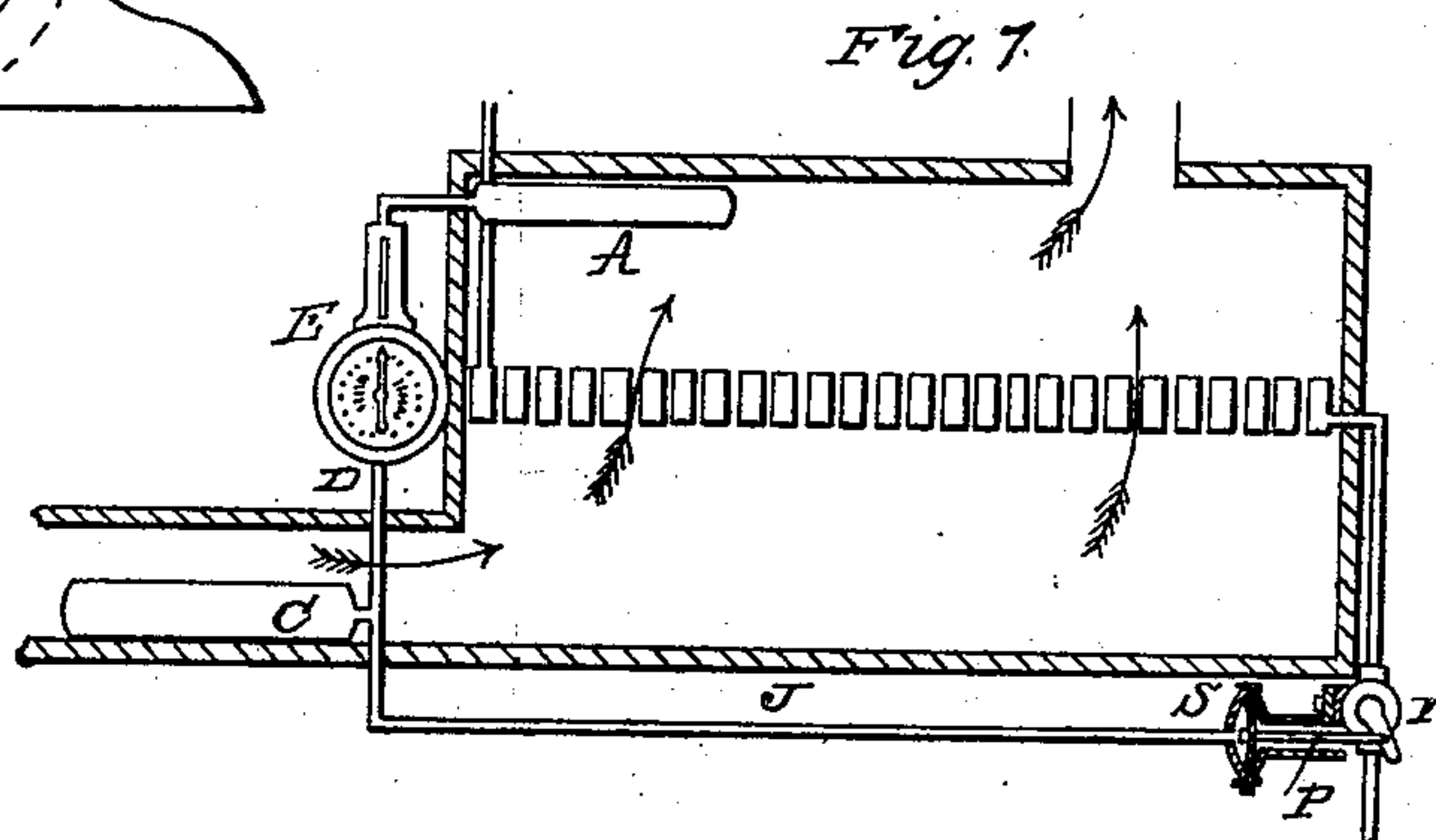
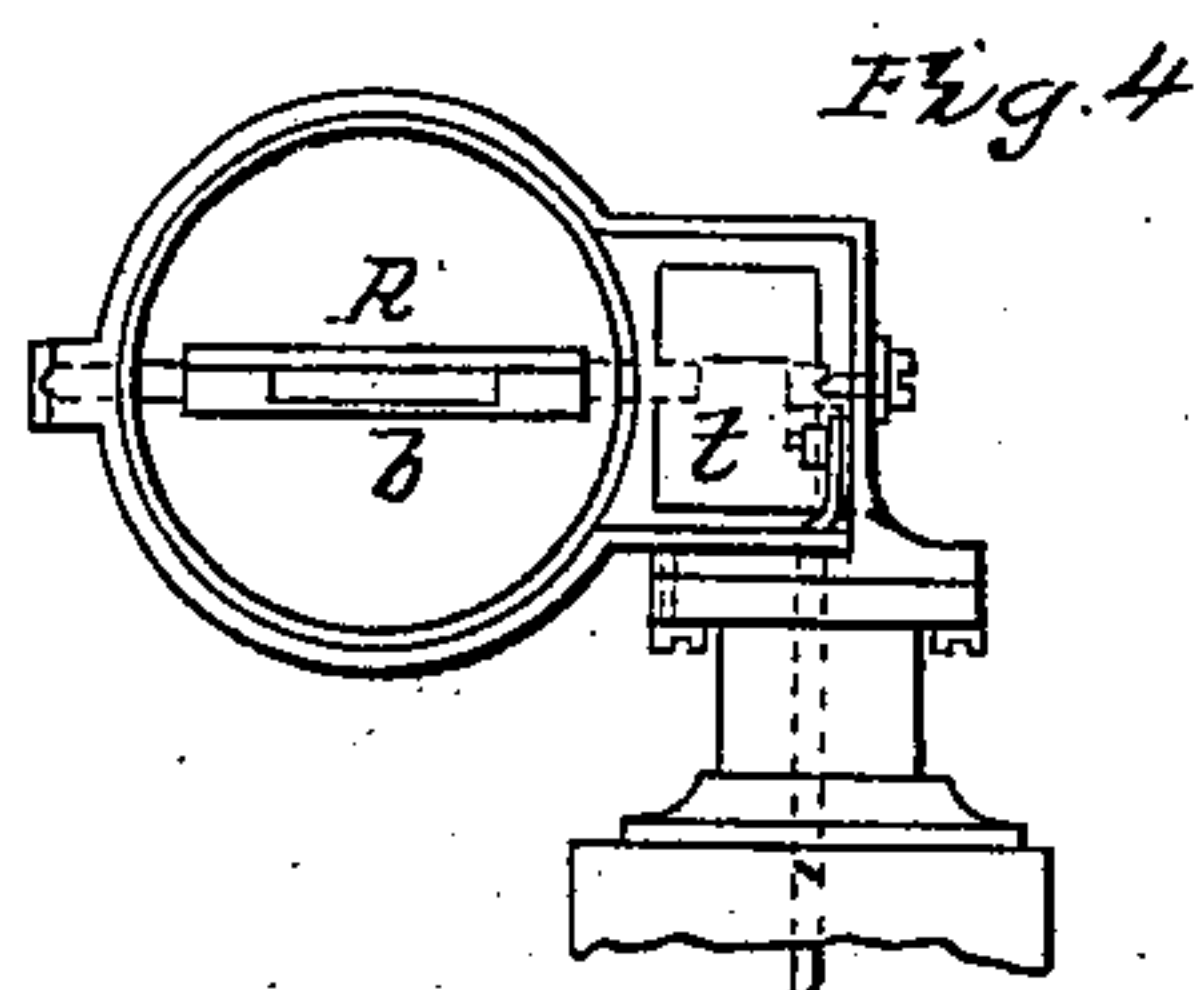
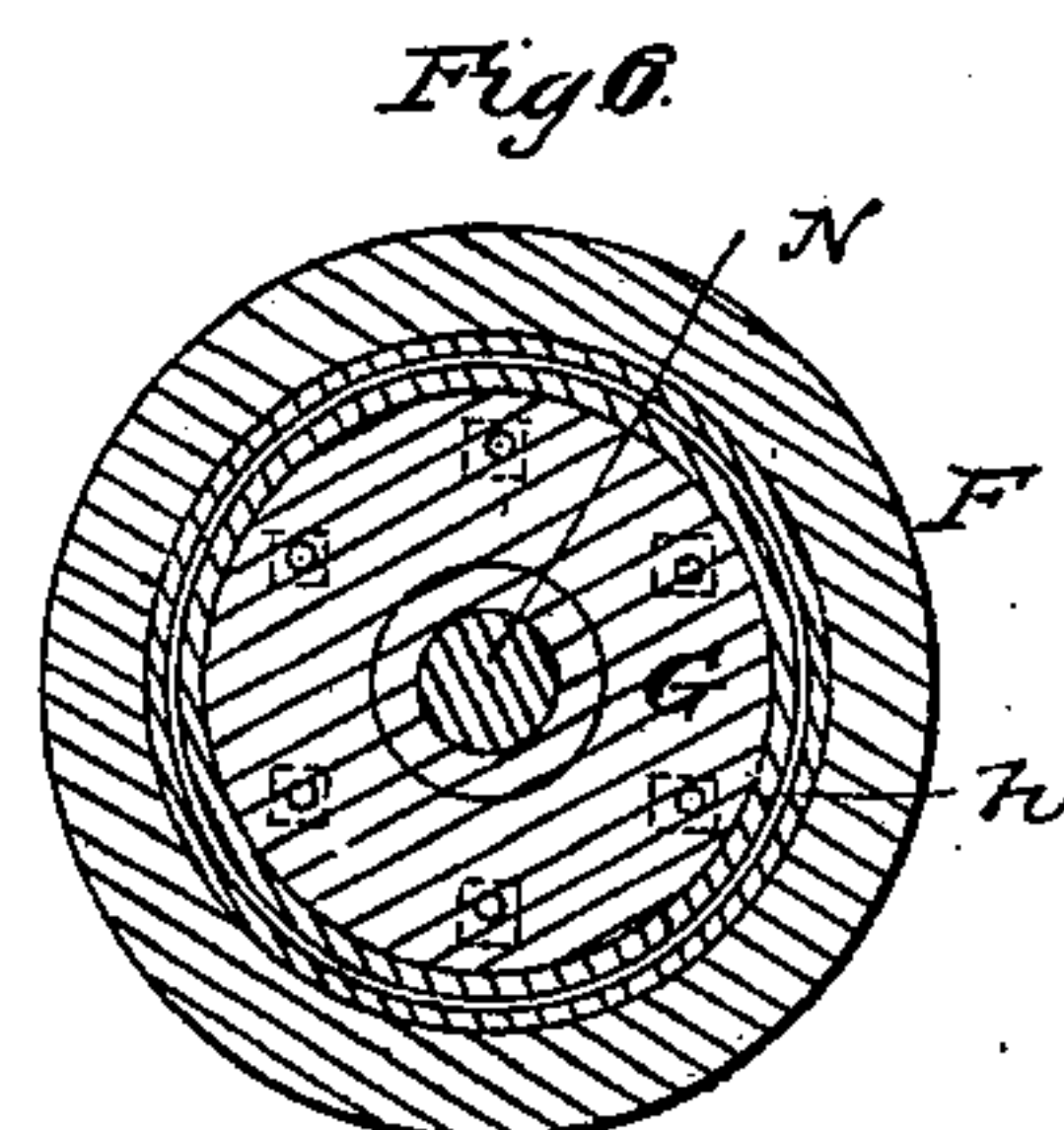
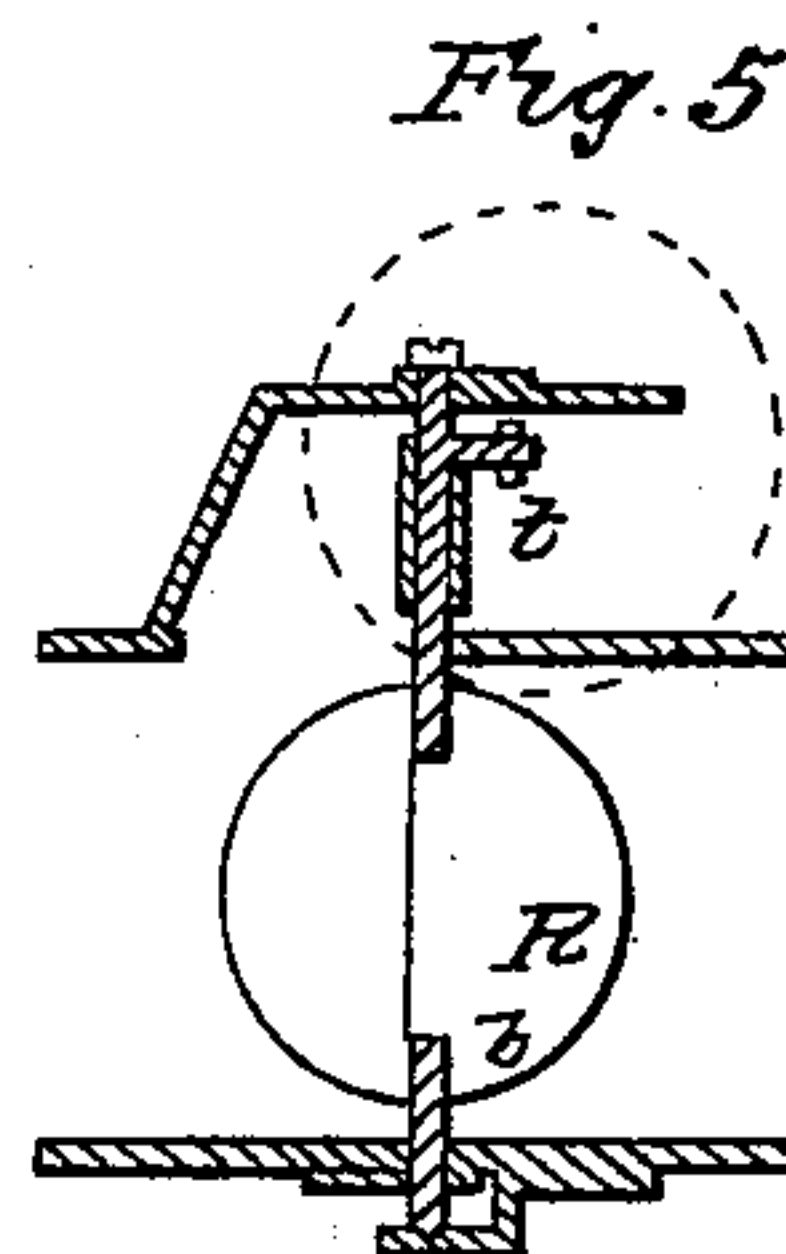
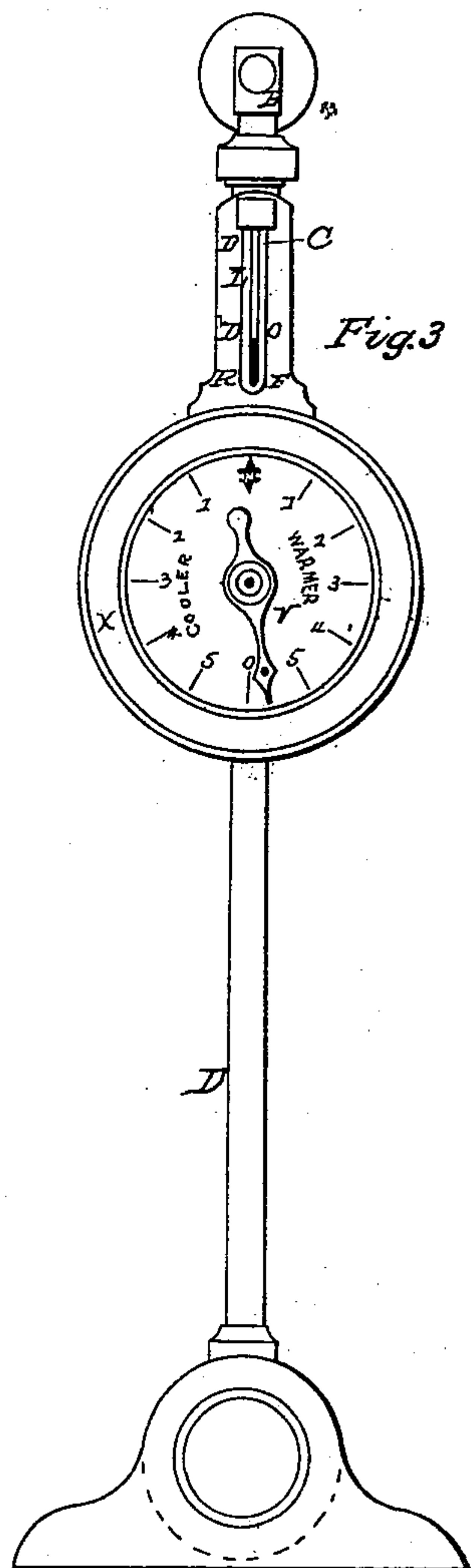
INVENTOR
Albert H. Tingley

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UNITED STATES PATENT OFFICE.

ALBERT H. TINGLEY, OF PROVIDENCE, RHODE ISLAND.

HEAT-REGULATOR FOR HOT-AIR FURNACES.

Specification forming part of Letters Patent No. 59,294, dated October 30, 1866.

To all whom it may concern:

Be it known that I, ALBERT H. TINGLEY, of Providence, in the county of Providence, in the State of Rhode Island, have invented a new and improved mode of regulating the action of heating apparatus, either of hot air, hot water, or steam; and I do hereby declare that the following is a full and correct description thereof, reference being had to the accompanying drawings, forming part of this specification, and to the letters of reference marked thereon, the same letters referring to like parts in all the figures.

Figure 1 is a vertical cross-section of a hot-air furnace, showing the position of the regulator. Fig. 2 shows a vertical section of the regulating apparatus separate from the furnace and on a larger scale. Fig. 3 shows a front elevation of the same from the right. Fig. 4 is an elevation of the damper from the left. Fig. 5 is a horizontal section of the same. Fig. 6 shows a vertical section of the prime regulator E, taken through in the direction of the red line *z z*. Fig. 7 shows the application of the regulator to a steam or hot-water heating apparatus.

This is an automatic heat-regulator intended to govern the operations of apparatus for warming houses, &c. Most regulators constructed for this purpose have only aimed, so far as they were automatic, to keep the heat of the air that passes through the furnace at one fixed point without regard to what the temperature of the atmosphere outside might be, when it is obvious that in cold weather a supply of hotter air is required to warm a building than in more moderate weather. To regulate the heater with regard to this point is the object of my improvement.

The construction is as follows: I place a vessel, A, containing air or gas, in the upper part of the furnace, or in such a position as to be affected by the changes in the temperature of the air heated by the furnace. This vessel is connected by a pipe, D, to another vessel, C, which I place in the passage *g*, through which the air to be heated is supplied to the furnace, or in such a position as to be affected by the changes in the atmosphere outside of the building.

The pipe J forms a connection between the two vessels A C and the damper R, that reg-

ulates the draft of the fire in the furnace. S is an enlargement of the pipe J, in which is placed a diaphragm, *a*, the center of which is connected by the rod P to the damper R, so that any alteration in the volume of the air in the vessels will move the damper by raising or depressing the diaphragm *a*. E is a primary regulator of the effect of the expansion or contraction of the air in the vessels A C upon the damper *a*. It consists of a case, F, having a plunger, G, between which and the case is placed a diaphragm, *h*. This diaphragm is in the nature of a packing, and any common direct packing may be used around the plunger G in place of it. The plunger G, being moved backward and forward in the case by means of the screw N, increases or diminishes the amount of air in the vessels A C.

L is a tube bent in the shape of the letter U and containing a portion of mercury, *e*, a connection being made with the air in the vessels A C by means of the pipe B, so that when the air expands it will press upon the mercury and cause it to rise in the other part of the tube, thus indicating the condition of the fire in the furnace by the degree of heat of the air-vessels A C.

A dial, *x*, is placed upon the front of the primary regulator, as seen in Fig. 3, and a hand, *v*, on the screw N to show the position of the plunger.

Instead of air the apparatus may be filled with gas or expansive fluids.

The arrangement of the damper and ventilator *t* will be seen in Figs. 4 and 5, both being placed upon the same spindle, *b*, so that when one is opened the other is closed. The operation is thus: Supposing the temperature of the air out of doors to continue the same, if the fire gets low the temperature of the air supplied by the heater falls, and the vessel A getting cooler the air inside contracts, and, by means of the pipe-connection D, draws down the diaphragm *a*, opening the damper R proportionably to increase the fire. When the air becomes of the proper temperature again the air expansion of the air in A closes the damper N by raising the diaphragm *a*; but if the atmosphere outside becomes colder the air in C grows colder and contracts. This, by drawing on the diaphragm *a*, opens the

damper R and increases the fire. At the same time drawing the air from the vessel A makes it necessary to heat it to a higher degree to expand the decreased quantity in it sufficiently to close the damper as before; consequently, the air passing from the heater will be maintained at a higher heat than before. On the contrary, if the temperature of the outside atmosphere becomes warmer, the air in C will expand and, pressing on the diaphragm *a*, will close the damper R, and at the same time will by pressure increase the quantity of air in A, which will consequently require less heat to expand sufficiently to keep the damper closed as before, and the temperature of the air coming from the furnace will be kept at a lower degree.

The primary regulator E is intended to enable any one to adjust the apparatus so as to maintain any particular average of temperature in his house in all weathers, which it does by increasing or diminishing the quantity of air in the vessels by turning the screw and drawing the plunger forward or pushing it in, thus increasing or diminishing the heat required to operate the damper R. The operation of the indicator has already been sufficiently described in the description of that part.

The application of this regulator to a heating apparatus using steam or hot water is substantially the same as already described, excepting that the expansion or contraction

of the air in the vessels A C operates upon a valve, *v*, (see Fig. 7,) that governs the admission of steam or hot water to the radiator instead of the furnace-damper.

Having thus described my improvements, what I claim, and desire to secure by Letters Patent, is—

1. The combination of the two vessels A C, connected together by the pipe D, substantially as described, and for the purpose set forth.

2. The adjuster E, constructed as described, by means of which the general effect of the expansion and contraction of the air, gas, or expansive fluid in the vessel A upon the damper R is controlled, substantially as set forth.

3. The combination of the indicator L, or its equivalent, by which the condition of the fire or the position of the damper is indicated by the expansion or contraction of the air in vessel A, with the vessels A and C, substantially as described, and for the purpose set forth.

4. The arrangement of the damper R and ventilator *t* upon the same spindle, *b*, substantially as described, and for the purpose set forth.

ALBERT H. TINGLEY.

Witnesses:

BENJAMIN ARNOLD,
HORACE N. FOSTER.