J. G. & E. W. H. COOPER.

Damper.

No. 62,821. Patented March 12, 1867.

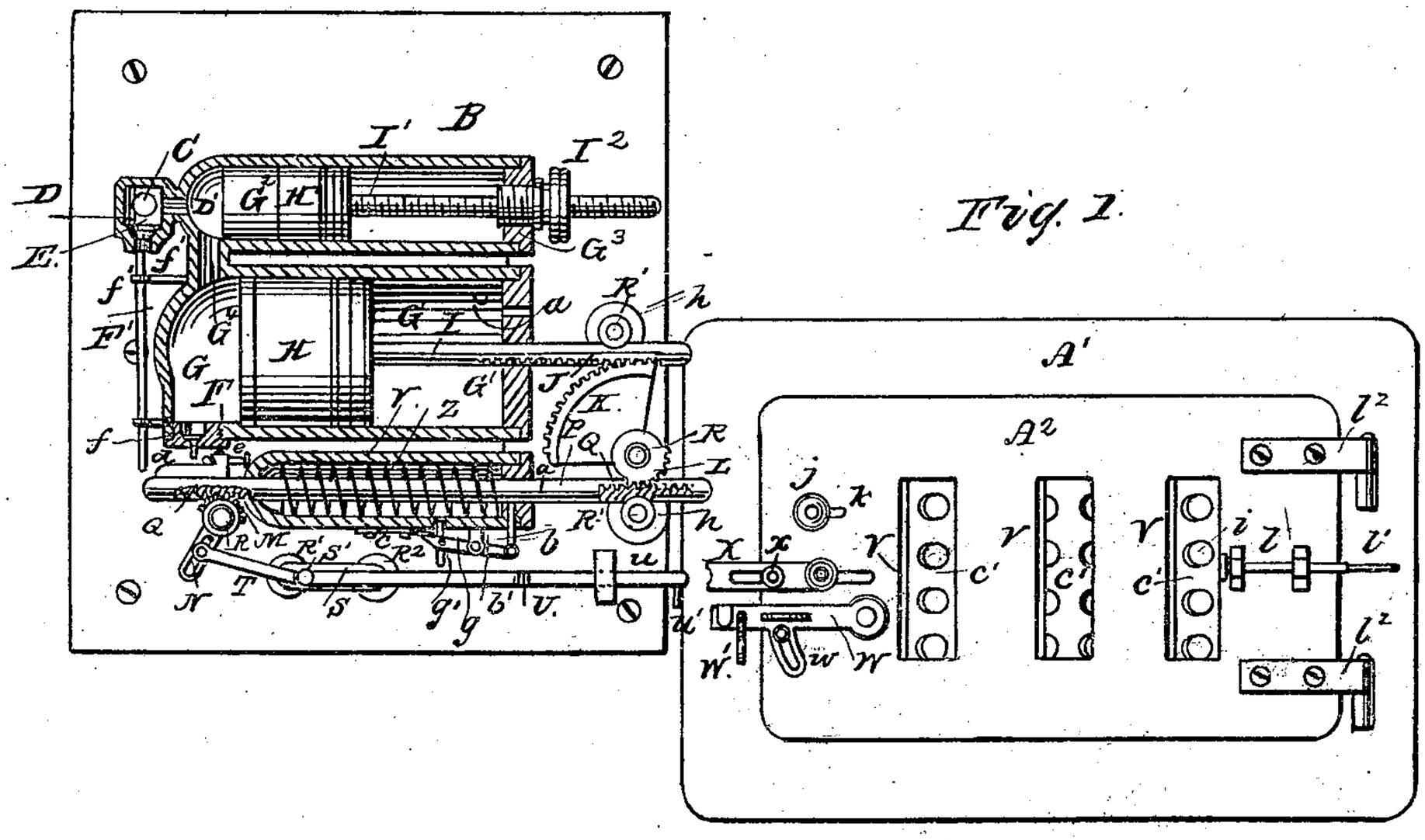

Fig. 1.

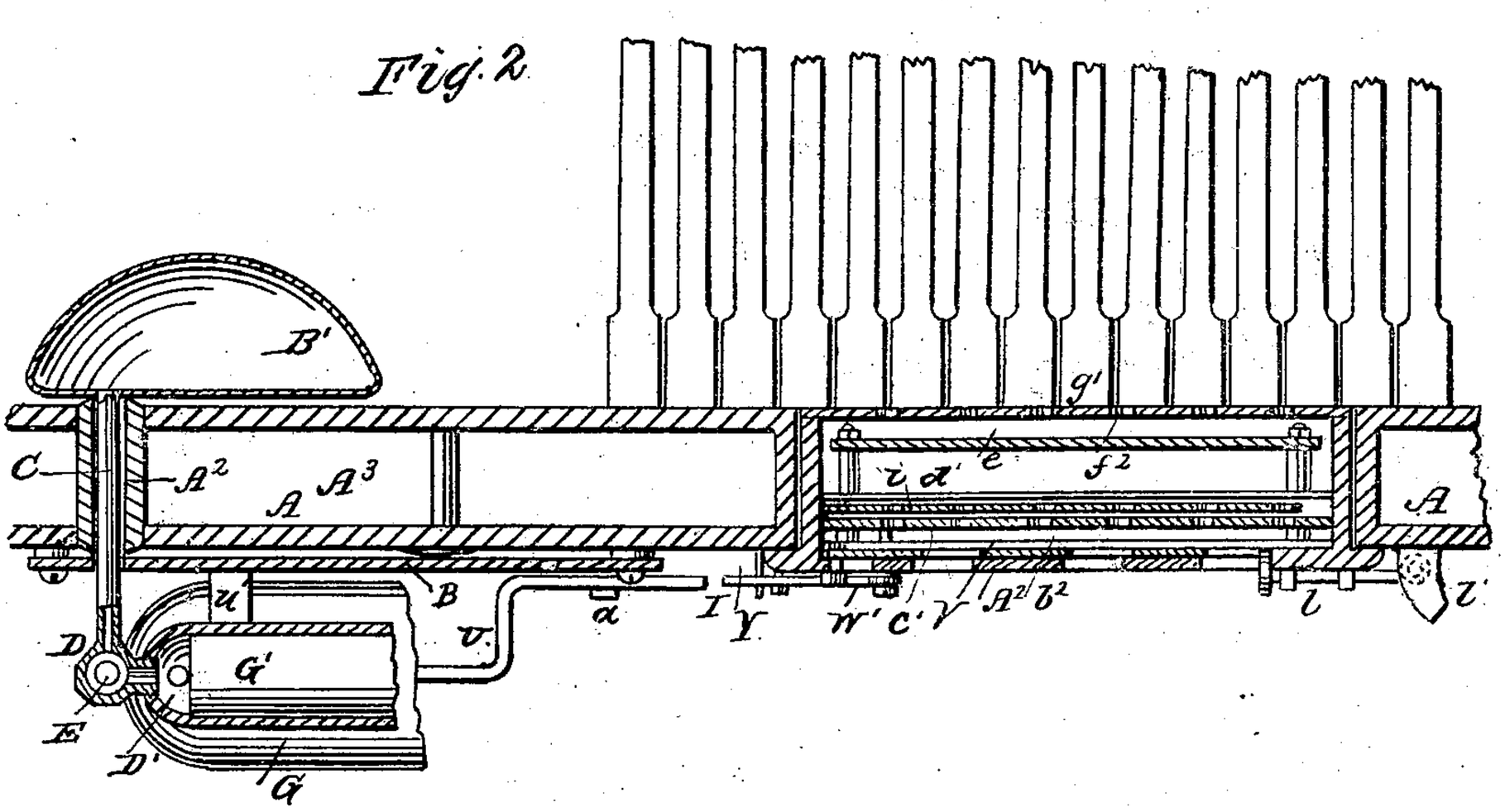

Fig. 2.

Witnesses

Inventors.

United States Patent Office.

JOHN GEORGE COOPER AND EDWIN W. H. COOPER, OF HARTFORD, CONNECTICUT.

Letters Patent No. 62,821, *dated March* 12, 1867.

CALORIC REGULATOR FOR BOILER FURNACES.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that we, JOHN GEORGE COOPER and EDWIN W. H. COOPER, of Hartford, in the county of Hartford, and State of Connecticut, have invented a new and improved Caloric Regulator; and we do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a sectional front elevation of this invention.

Figure 2 is a transverse section of the same.

Similar letters of reference indicate like parts.

This invention relates to a regulator in which the air enclosed in a suitable heater and exposed to the action of the fire in the furnace, is caused to open and close a damper in the furnace door.

Our apparatus consists of a heater, B^1, which is attached to the interior of the front plate A of the furnace, on the opening side of the door, as shown in the drawing, or if the apparatus is to be used for two furnaces, we place it between the two doors in such a position that it will be heated by the burning fuel on the grate. Said heater is fastened by a hollow stay-bolt, A^4, which passes through the water space A^3, and which acts as a thimble to receive the heater pipe C, one end of which is secured in the heater and the other into a valve chamber, D. This chamber communicates through the passage D^1, with the regulating chamber or reservoir G^2, and consequently this reservoir communicates freely with the heater. The heater pipe C may, however, be secured directly into the regulating chamber G^2, instead of in the valve chamber D. The regulating chamber G^2 is fitted with a piston, H^1, which is secured to a screw-rod, I^1, and the screw-rod passes freely through the head G^3 of the chamber G^2, and it is adjusted by the nut I^2 so that the effective space of the chamber G^2 can be increased or decreased at pleasure. The chamber G^2 communicates through the passage G^4 with the working cylinder G, which is provided with a piston, H, the rod I of which extends through the head G^1, and this head is perforated to prevent back pressure. The pistons H and H^1 are hollowed out on their front sides, and filled with plaster Paris, fire-clay, or other non-conducting material, to prevent the heat from producing an injurious effect on the packing. The piston-rod I is provided with a toothed rack, J, which gears in a segment, K, mounted on a stud, R, and connected to a smaller segment, L, the teeth of which gear in teeth, O, cut into the rod P. This rod passes through the spring box Y and a spring, Z, enclosed in this box, has a tendency to force the rod P in the direction of the arrow marked thereon in fig. 1, said spring being made to bear on a pin passing transversely through the rod P. Said rod passes clear through the spring box Y, and it is provided with teeth, Q, which gear in a toothed segment, M, mounted on a stud, R. From this segment extends a slotted arm, N, which connects by a rod, T, and pivot, S^1, with the damper-rod U. This damper-rod is guided by a slot in the stud *u*, and by a bracket, S, which is provided with a guide groove to receive the head of the pivot S^1. Suitable guide rollers, *h h*, prevent the rods I and P from getting out of gear with their respective segments. The rod P is provided at its under side with a socket, *a*, to receive a dog, *b*, which is hinged to one end of a lever, *g*, which has its fulcrum on a pivot, b^1, and the other end of which is subjected to the action of a spring, *c*, which has a tendency to force the dog *b* into the socket *a* whenever said socket comes in the proper position, and if this takes place, the dog *g**, which is also pivoted to lever *g*, near to that end which is subjected to the spring *c*, sinks down so that its lower end bears on the damper-rod U. On the upper side of the rod P is secured an elevation or trip, *d*, which, when said rod moves in the direction opposite the arrow marked on it in fig. 1, strikes the rod F^1, which is guided in suitable brackets, f^1, and connects with the valve E enclosed in the chamber D, and another trip, *e*, serves for opening the valve *f*, which is enclosed in a chamber, F, in the outer end of the cylinder G. A hole, u^2, in the inner end of this cylinder serves to introduce oil or other lubricating material. The damper-rod U acts on an arm, X, which extends from the sliding shield or damper V, which is inserted into the furnace door A^2. This door is secured by hinges, l^2, to the frame A^1, and it is provided with rectangular or other suitable openings. It is locked by a latch, W, with a slotted segmental guide, which straddles a suitable pin, *w*, and said latch locks with a catch, W^1. Between the hinges l^2 a rod, *l*, is situated, which is guided in suitable brackets, and the outer end of which acts on a lifter or cam, l^1, which is so shaped that when the door is opened said rod is forced in towards the latch W. If the damper V is closed and the door is opened, the head of the rod *l* opens the damper, so that no fresh fuel can be introduced without having the damper opened. In the interior of the furnace door is situated a sheet, c^1, with apertures of a circular, square, or any convenient form, and on the back or inside of this sheet is fitted the supplementary slide or regulator *i*, with apertures corresponding in size and position to the apertures in the sheet c^1. This secondary slide is adjusted by a button,

j, moving in a slot, *k*, in the front plate of the furnace door, and by this slide the quantity of air to be admitted into the furnace is regulated, this quantity being variable according to different classes of fuel requiring different quantities of oxygen to form a perfect combustion. Between the slide V and sheet e^1 a chamber, b^2, is formed, for the purpose of heating the air, and after passing the slide *i* the air reaches a second heating chamber, d^1, situated between said slide and the blind-sheet e^1. Between this blind-sheet and the second perforated plate g^1, (which forms the inside cover of the furnace door,) a third heating chamber, f^2, is formed, and the air being heated while passing through the several heating chambers, is admitted to the fuel through the apertures in the plate g^1. The damper or shield V, and regulating sheet *i*, will be attached to the furnace door by means of grooved projections at top and bottom of the door, so that they slide freely. The sheets c^1, e^1, and g^1 may be attached to the door by means of thimbles inserted between them, and tie-bolts running through the hole in order to lock them together, or they may be attached by means of shelves cast on the door or in any other suitable way.

The operation is as follows: When a fresh supply of fuel is introduced in the furnace, the damper V is wide open, so as to admit the necessary quantity of atmospheric air, which, while passing through the several heating chambers, is heated, and in this state it passes through the perforated sheet g^1 over the burning fuel, thereby consuming the carbonic oxide and other gases evolved from the burning mass, and preventing the same from escaping through the smoke-stack or chimney in the form of smoke. During this stage of the operation the valves E and *f* remain closed, and the caloric in furnace acts on the heater B^1, causing the air therein and in the regulating chamber G^2 and cylinder G to expand. As the fuel in the furnace becomes gradually more and more incandescent, the quantity of smoke evolved by the same diminishes, and less and less air is required to consume such smoke, and in order to regulate the quantity of air admitted, the expanding air in the heater B^1, chamber G^2, and cylinder G acts on the working piston H, causing the piston-rod I to impart motion to the segmental gears K L, whereby the rod P is pushed back against the action of the spring Z. At the same time motion is imparted to the segment M, and through it to the rod U, which, by pressing on the sliding rod X, causes the damper V to close gradually, so that the apertures in the furnace door are becoming smaller and smaller, until they are closed altogether. By these means a perfect combustion, or very nearly so, is effected, the ordinary supply of air through the grate being now sufficient to the demands of the fire, until the furnace is again charged with a fresh supply of fuel. As the rod P reaches the backward end of its stroke it is caught by the dog *b* dropping into the recess *a*, and at the same moment the trip *d* lifts the rod F^1, thereby opening the valve E, and simultaneously therewith the trip *e* lifts the valve *f*, and cold air is admitted to the cylinder G, chamber G^2, and heater B^1. If the furnace is now opened, the latch W, by coming in contact with a pin, u^1, projecting from the under side of the rod U, causes said rod to rise and to press on the pin g^*, and thereby the dog *b* is disengaged from the socket *a*, and the rod P is permitted to follow the action of the spring. The valve E is closed, and the rod U and piston H return to their original position, and as said piston reaches the back end of its stroke, the valve *f* closes, and the apparatus is ready for a subsequent action. In order to enable the trip *e* to retain the valve *f* after the valve E has closed, said trip is made to slide back and forth in the trip *d*. As the door A^2 swings open on its hinges, the rod *l*, by sliding upon the cam l^1, causes the damper V to open automatically ready for the next operation. By the regulating piston H^1 the quantity of air in the chamber G^2 can be reduced, if found necessary, and by these means the pressure of the expanded air acting on the working piston is also reduced, and the damper V is made to move slower and slower, according to the nature of the fuel used in the furnace. The quantity of air admitted to the furnace can also be regulated by the slide *i*, which is operated by means of the button *j*, and which is set according to the nature of the fuel used.

What we claim as new, and desire to secure by Letters Patent, is—

1. The heater B^1, working cylinder G, piston H, and rod I, in combination with the sliding-spring rod P, pusher rod U, and damper V, constructed and operating substantially as described, so that the position of the damper is regulated automatically by the expansion of the air or other elastic fluid in the heater.

2. The regulating chamber G^2, in combination with the heater B^1, working cylinder G, spring rod P, and damper V, constructed and operating substantially as and for the purpose set forth.

3. The arrangement of an adjustable piston, H^1, in the regulating chamber G^2, to operate in combination with the heater B^1 and cylinder G, substantially as and for the purpose described.

4. The valves E *f* and trips *d e*, in combination with the chamber G^2, cylinder G, and rod P, constructed and operating substantially as and for the purpose set forth.

5. The spring catch *b* and recess *a*, in the rod P, arranged to operate in connection with the rod U and latch W, substantially as and for the purpose described.

6. The perforated plate c^1 and regulating slide *i*, in combination with each other and with the furnace door A^2 and rear shield e^1, constructed and operating substantially as and for the purpose set forth.

7. The sliding pin *l* and cam l^1, in combination with the damper V and furnace door A^2, constructed and operating substantially as and for the purpose described.

8. The chambers b^2 d^1 f^2 in the furnace door A^2, in combination with the damper V, slide *i*, shield e^1, and perforated plate g^1, constructed and operating substantially as and for the purpose set forth.

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EDWIN W. H. COOPER.

Witnesses:
H. T. SPERRY,
J. H. PYNCHON.