I. HAYES.

DRAFT-REGULATOR.

No. 177,121. Patented May 9, 1876.

Fig. 1.

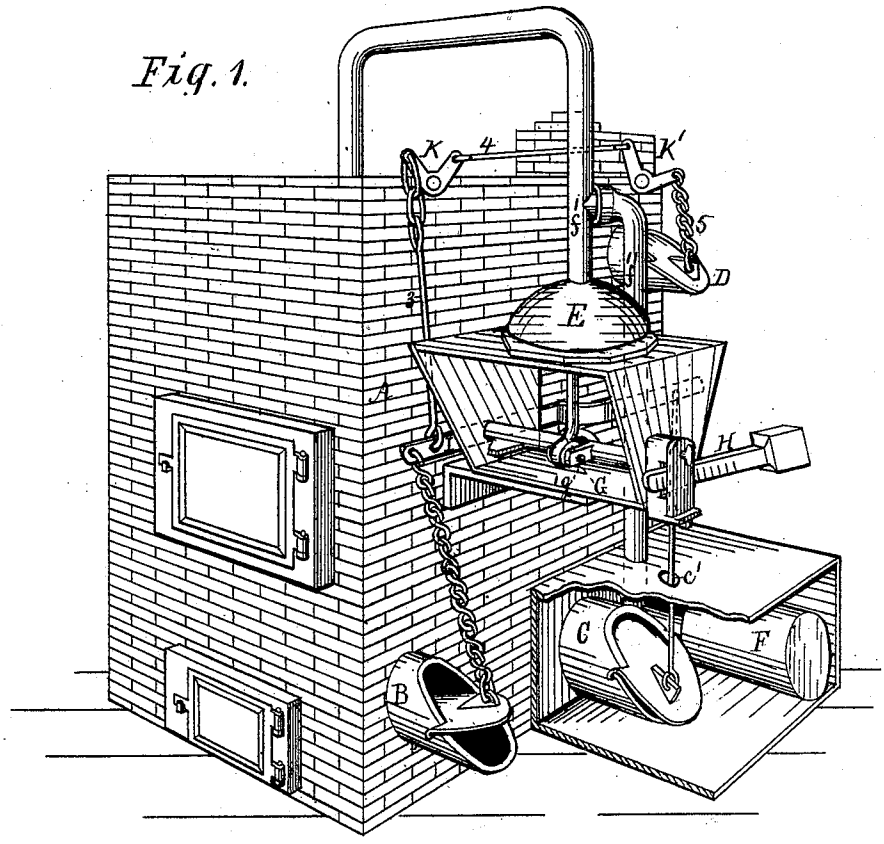


Fig. 2

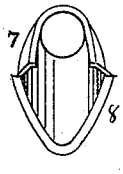
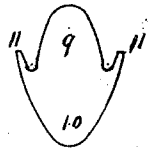


Fig 3



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IMPROVEMENT IN DRAFT-REGULATORS.

Specification forming part of Letters Patent No. **177,121**, dated May 9, 1876; application filed April 11, 1876.

To all whom it may concern:

Be it known that I, ISAAC HAYES, a resident of the city of Philadelphia, in the State of Pennsylvania, have invented a new and useful Improvement in Automatic Heat-Regulators for Hot-Air Furnaces, which improvement is fully set forth in the following specification, reference being had to the accompanying drawings, in which—

Figure 1 is a perspective view of the exterior of the front, and one side of an ordinary hot-air furnace, having my invention applied thereto; and Figs. 2 and 3 respective views of the valve-plate and its corresponding mouth (of either of the three valves) detached, for the purpose of showing more clearly the peculiar construction of the same.

My invention relates more especially to the "heat-regulators for hot-air furnaces," for certain improvement in which Letters Patent of the United States No. 128,485 were granted to me, dated July 2, 1872; the characteristic feature of my said improvement consisting in the combination and arrangement of a fire-draft valve and a chimney-draft damper-valve, operated simultaneously, to regulate the degree of heat desired in the air of the air-heating chamber of the furnace, by the expansion and contraction of the air in the air-heating chamber upon an inclosed elastic diaphragm, connected with a weighted lever, so that when the air in the heating-chamber becomes too hot the fire-draft valve will be partially contracted or closed, and the chimney-draft damper partially or more fully opened, and vice versa, when the air in the air-heating chamber has become too cool, thus automatically keeping the temperature of the required heated air nearly uniform.

There is a defect, however, in the above-described automatic heat-regulator, in that there is not any provision for regulating the supply of fresh air into the heating-chamber, which is a defect the removal of which is of very considerable importance—because, in such case the supply of the fresh cold air to the air-heating chamber is nearly invariable in quantity, while the heat generated by the combustion of the fuel in the fire-box or cylinder is variable, and consequently when the fire is low or weak the said fresh-air current is not sufficiently warmed to serve the purpose desired.

The principal object of my present improvement is to remedy the said defect, and this I accomplish by the combination, with the mouth of the inlet for the fresh air which is to be warmed, of an automatically-actuated valve, arranged to work as will hereinafter be described.

Another object of my said present improvement relates to the peculiar structure of the several valves, especially as to the mode of connecting the plate with the seat, whereby they will operate together with more accuracy and ease, and cost less in construction and application.

Referring to Fig. 1, A is the furnace; B, the fire-draft valve; C, the fresh cold air draft valve; D, the chimney-damper valve; E, the case, containing the usual elastic diaphragm (not shown) communicating with the air-heating chamber in the furnace A, and with the cooling-cylinder F on the outside of the said furnace A, by means of the tubes or pipes *f' f''*; G, the rigid stem fixed to the diaphragm in E, and connected to the rock-shaft *g'*, the outer end of which carries the adjustably-weighted lever H, and the inner projecting end carries the lever I, and the right-hand arm of which latter is connected by a chain or wire, *c'*, to the plate of valve *c*, and the opposite arm in the same manner to the plate of the fire-draft valve B, and also to the plate of the chimney-damper valve D above, by means of the turn-buckles K K', and the connecting wires or chains 3 4 5, substantially as represented in the drawing, Fig. 1. The connections between the valves B C D are adjustably attached together and to the horizontally-arranged lever I of the rock-shaft *g'*, which carries the adjustably-weighted lever H, so as to operate together, substantially as will now be described and explained, in regulating the temperature of the air passing through the air-heating chamber of the furnace.

When the furnace is working under an ordinarily-good fire the plate of the fire-draft valve B will be held nearly in a horizontal position, or not quite fully opened, the plate of the fresh cold air valve C partially opened, and the plate of the damper-valve D closed

down nearly air-tight, as shown in Fig. 1; but if the fire become stronger, and consequently the air passing through the air-heating chamber raised in temperature, the diaphragm in the ca e E will be pressed downward, carrying with it the rigid bar G, which is articulated to the rock-shaft g', and consequently causes the left-hand arm of lever I to descend gradually, and thus allow the valve-plate of B to sink by gravitation, and thus diminish accordingly the area of the fire-draft opening in the valve. At the same time the right-hand arm of the lever I, rising, lifts gradually the lower end of the plate of valve C, and allows a larger area of opening for the entrance of the cold fresh air into the air-heating chamber, and thus further reduce the temperature of the air in the said chamber; and if the temperature be still too high, the lever I becomes farther tilted downward, and thus causes the plate of the chimney-damper valve D to be lifted, and thus allow cold air to enter the chimney, and effectually complete the reduction of the temperature of the air passing through the furnace. If at any time the fire get too low, and the air too much reduced in temperature, the damper-valve D immediately closes, the opening between the plate and seat of the valve C reduced, and the opening in the valve B enlarged.

It will be seen that if the connecting devices between the valves B C D be properly adjusted to cause the air passing through the air-heating chamber to be heated to the required degree of temperature by an ordinarily-good fire in the furnace, the same, or nearly the same, temperature of the air will be maintained automatically, notwithstanding any variations in the strength of fire in the furnace.

It will also be seen that, if the fire should become extinguished, as sometimes will be the case for want of fresh fuel, especially in the night, the valve C will become entirely closed, in consequence of the wider opening of the valve B, and consequently the entrance of fresh cold air into the air-heating chamber will be prevented, and the temperature of the chamber and the air therein will be maintained, or but slightly reduced, and the entrance of cold air into the chamber above, as heretofore, entirely prevented.

The three valves B C D are each constructed alike, except as to size, substantially as represented in Fig. 1.

The seat of each valve is oval in the area of its opening or throat, and the oval is formed by cutting off the cylindrical conduit-pipe at an angle of about forty-five degrees, and thus causing a downward outward-sloped seat, substantially as represented in Fig. 1. Each of the two side edges of the oval opening is cut across at a right angle to the plane of the opening to the depth of, say, an eighth or three-sixteenths of an inch, both cuts being in alignment with the shorter diameter of the oval, (see Fig. 2,) and then the edge of the upper half of the oval turned inward, and the edge of the lower half turned outward, as represented by 7 and 8, respectively, thus producing two flat bearings nearly in the plane of the oval opening.

The plate of each valve is of sheet metal, and cut out so that one end, 9, (see Fig. 3,) will accurately fit against the under side of the bearing 7 of Fig. 2, and the other or heavier and larger end, 10, so that it will fit over on the bearing 8, and so cut out also as to leave two projections or ears, 11 11, at its side edges, substantially as represented in Fig. 3. The two parts, Figs. 2 and 3, are then adjusted together, with the end 9 of the plate against the under side of the plane 7, and the end 10 of said plate upon the upper side of 8, and finally the ears 11 11 bent down over and slightly under the respective square-cut ends of the plane 8, which connecting parts will then serve as the axis of motion for the valve-plate, and thus dispense with the use of arbors or journals for the purpose.

I claim as my invention—

1. The combination, in an automatic heat-regulator for air-heating furnaces, substantially as described, of the automatically-actuated valve C, with the mouth or entrance opening for the fresh cold air into the air-heating chamber.

2. The combination, in an air-heating furnace, substantially as described, of the valve C with the valves B and D, all of the said valves being actuated, when in use, by the variations of the temperature of the air in the air-heating chamber of the furnace, and the gravitating tendency of the lower ends of the respective valve-plates, as described.

3. The valves B C D, each consisting of the combination of the inclined oval seat, having the flat bearings 7 and 8, and the valve-plate 9 10, having the projecting ears 11 11, the plate and seat being attached together, as described and shown in Fig. 1.

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