2 Sheets--Sheet 1.

J. D. WILLOUGHBY.

Stove-Dampers.

No. 135,611. Patented Feb. 4, 1873.

Fig. 1.

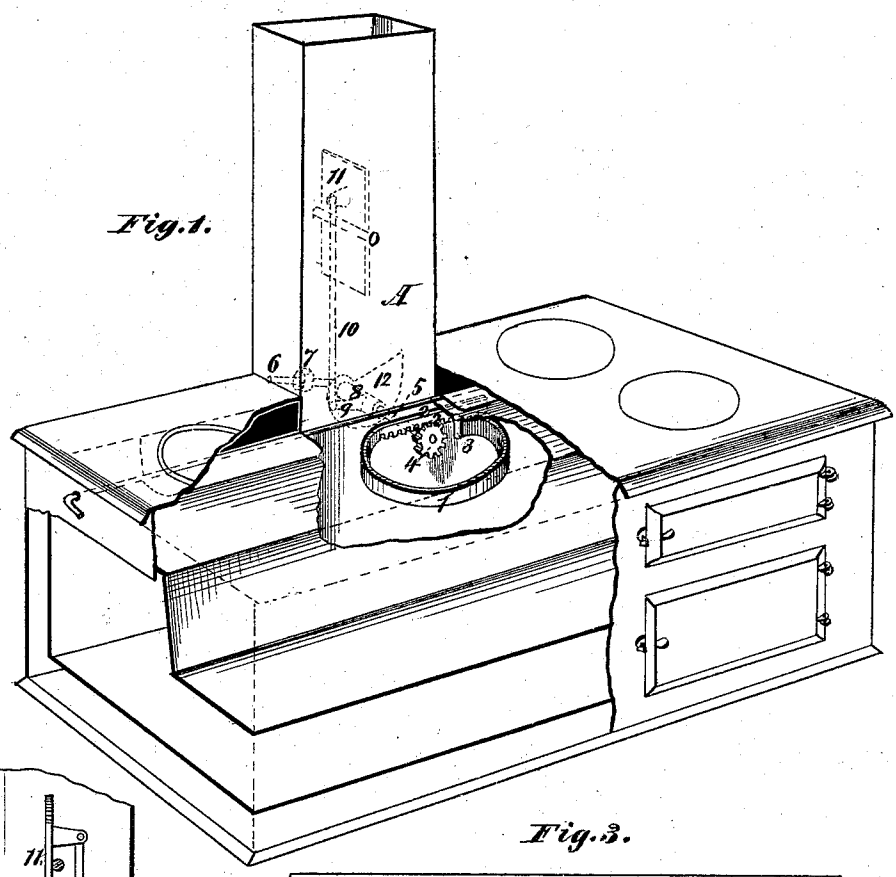


Fig. 2.

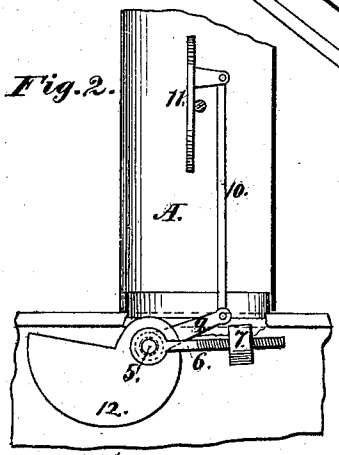
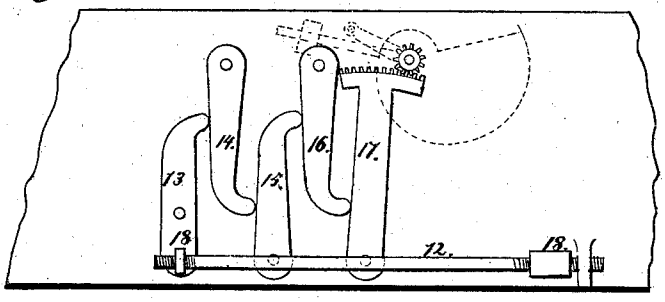


Fig. 3.



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AM. PHOTO-LITHOGRAPHIC CO. N.Y. (OSBORNE'S PROCESS.)

2 Sheets--Sheet 2.

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Fig. 4.

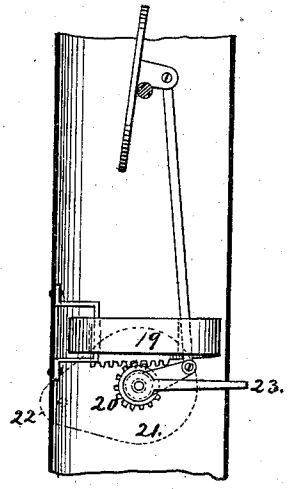


Fig. 7.

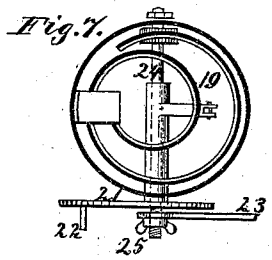


Fig. 5.

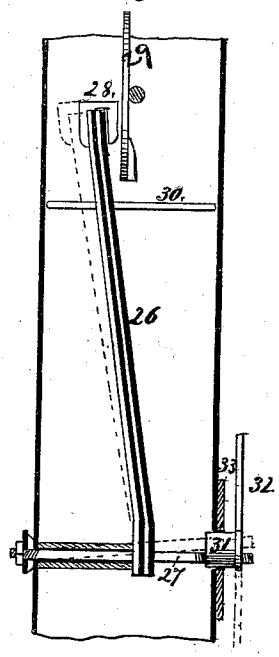
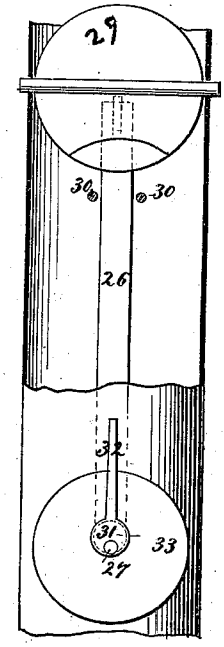


Fig. 6.



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UNITED STATES PATENT OFFICE.

JAMES D. WILLOUGHBY, OF WASHINGTON, DISTRICT OF COLUMBIA.

IMPROVEMENT IN STOVE-DAMPERS.

Specification forming part of Letters Patent No. **135,611**, dated February 4, 1873.

To all whom it may concern:

Be it known that I, JAMES D. WILLOUGHBY, of Washington city, District of Columbia, have invented certain Improvements in Automatic Stove-Dampers for Bake-Ovens and other Stoves; and I do hereby declare that the following, taken in connection with the drawing which accompanies and forms part of this specification, is a description of my invention sufficient to enable those skilled in the art to practice it.

My improvements have reference to automatic dampers which are operated by the heat of the stove to which they are applied; and they consist in certain novel and special devices, hereinafter described, for accomplishing this.

Figure 1 illustrates one form of my invention as applied to the pipe of a cooking-stove, and Fig. 2 a detached view of parts of the same. Fig. 3 is a modification, the parts which actuate the pinion being different from the means employed in Figs. 1 and 2.

The remaining figures illustrate other modifications, more particularly described hereinafter.

The leading principle of that part of my invention, which under an expansion of metal by heat gives motion to the damper, is embodied in what I call a heat-gage, and which is of peculiar construction. This heat-gage is shown in one form at 1 in Fig. 1, and it is composed of two different metals having under the same degree of heat different powers or degrees of longitudinal expansion. The two pieces (preferably iron and brass, the iron being upon the outside when the gage is bent or coiled, as shown in this figure) are so put together by rivets or otherwise that at the free end 2 of the gage they shall not be capable of standing apart from each other, but, on the contrary, remain constantly closely united at that point, as well as in close contact throughout their lengths; in this particular differing essentially in principle and in action from another character of compound gage heretofore patented, in which two straight strips diverge from each other and operate a lever which is pivoted directly to the end of one strip, as its fulcrum, and at some distance therefrom pivoted to the free end of the other strip at the power point, the damper-actuating devices being connected to the other end of such lever, so that the damper, whether desired or not, must unavoidably be moved at the instant the strips contract or expand. The end 3 of my coiled compound gage I affix permanently or securely to any appropriate part of the stove or pipe, or other stationary fixture, as shown, and I form teeth in one edge of its free end, these teeth engaging with those of a pinion, 4, on a shaft, 5, shown in this instance as passing through the stove below the pipe A. To the outer end of this shaft is rigidly affixed an arm, 6, which is screw-threaded, (see Fig. 2,) to receive an adjustable nut, 7. Loosely hung on the same shaft is a sleeve, 8, having an arm, 9, which, by a connecting-link, 10, actuates the damper 11 to open or close it, in whole or in part, in accordance with the degree of heat and at just such degree of heat as shall be previously determined upon before it will operate at all. To the outer end of this sleeve is secured a cam-shaped piece, 12, which remains at rest, and consequently inoperative to effect the closing of the damper through the agency of the arm 9 and link 10 until it shall have been brought into action by the contact with its edge of the nut 7.

The parts being set, as in Fig. 2, and the valve or damper open, it will now be readily seen that when the heat actuates the compound heat-gage 2 the metal of which its inner side is made will expand more rapidly than that which forms its outer surface, and hence the gage, as a whole, exerts a tendency to straighten itself. This tendency results in a longitudinal motion of the straight part of its free end, the teeth upon which must therefore actuate the pinion 4, with which they engage, and give the movement heretofore named to the arm 6.

An adjustment of the nut 7 permits any variation of the period at which the nut shall come in contact with the cam 12 and actuate the valve to close it, and this can therefore be set at will for any desired degree of heat required, and the valve therefore will refuse to move until that degree shall be attained in the stove. A scale upon the face of the cam, or at any other convenient place, may be used to indicate to the eye the degrees of heat, and thus determine with accuracy the precise position for setting the apparatus.

The valve or damper should be so hung (by its own weight preferably) as to remain open in its normal position, and then, after being automatically closed at the high degree of heat required, it becomes also automatic in its action for the preservation of that degree, inasmuch as it then checks the draft, and upon the heat of the fire falling below the assigned degree the valve will open accordingly and permit a renewal of the draft.

Fig. 3 shows the same valve mechanism as in Figs. 1 and 2, but the means for actuating the pinion are different; for, instead of being a compound bar, as above described, it consists of a single brass rod, 12, the expansion of which over and above that of the iron of the stove to which it and its lever are attached causes the movement of a lever, 13, which in turn actuates the next lever, 14, and so on through the system of levers, the last of which moves the rack-lever 17, and thence the pinion. It will be seen that the levers are so hung as to multiply motion, so that a slight expansion of the rod 12 will give all the motion required to the damper. Screw-threads and nuts 18 on the rod 12 afford means of adjustment.

In Figs. 4 and 7 I have shown another modification, the compound heat-gage 19, composed of two different metals and coiled with the more expansible metal on the inner side, being placed in this instance within the pipe, and the rack on its free end actuates the pinion 20, in the manner heretofore described. Instead, however, of the cam-piece 12, shown in Figs. 1 and 2, I substitute a plate, 21, having thereon a pin, 22, and which becomes actuated to operate the damper only when struck by the arm 23, which is affixed adjustably to the pinion-shaft 24. This arm may be adjusted to any desired position by means of the tightening-nut 25, so as to set it for the precise degree of heat required. The damper will not be actuated until this degree of heat is first attained. Any ordinary scale on the plate 21 (not needing to be illustrated) will serve to indicate the degree of heat required.

Figs. 5 and 6 show another modification. In this case the heat-gage 26 is composed of four strips, the iron and brass alternating, the iron of the compound gage being in this as in the other figures designated by the solid heavy black lines. This gage is not coiled or bent into a curve, but forms a bar which in the main is straight, one end being fastened permanently to a shaft, 27, and the metals being held together at their other end, those of each pair by a rivet, and the two pairs by a clasp to prevent lateral separation, and that end of the bar being free in space. This clasp is fastened only to one of the strips or to one only of the pairs, and serves to prevent the ends of the several strips or pairs from getting apart, but yet allowing of perfect freedom of the motion produced by expansion. The effect of the expansion of this bar by heat is that the bar will bow, so that its free end will be swayed, and approach and come in contact with and actuate the damper 29 so as to close it. Guide-rods 30 30 prevent the bar swinging edgewise. Upon one end of the shaft 27 is an eccentric bearing, 31, to which is affixed an arm, 32. By setting this arm at any desired degree of heat, which may be indicated upon a scale upon a dial-plate, 33, placed upon the outside of the pipe for this purpose, it will be seen that the loose or free end of the bar 26 will be set proportionately nearer to or further from the damper, and consequently the latter will be actuated by it only when the prescribed degree of heat shall have been attained, and that then the damper will be at once closed. The dotted lines in Fig. 5 show the arm, eccentric, and shaft set in position to place the bar in its position most distant from the damper. It is not always essential that this bar should be composed of four or more pieces, for one strip of each of the different metals would answer, if made thick enough, and secured by rivets or otherwise throughout their lengths, so as not to bow out from each other at any point.

It will be evident that my compound gage, in any form in which it may be used, may be composed, if desired, of more than a single pair of strips, the principle remaining the same, whether two, four, or more be used, it being only essential that it be made up of two different metals having different capacities of expansion, and that the strips be so fastened together that when expanded they shall still be held closely together throughout their lengths.

By my system of automatic action of the damper at any desired degree of heat previously determined upon for the purpose wanted, whether for cooking, for heating of apartments or other purposes, it will be seen that so long as there be fuel enough in the stove, range, or furnace, as the case may be, to create the highest degree of heat required, no attention of an attendant is needed to keep up and preserve the heat at this degree, as the apparatus governs itself, however careless or forgetful the servant or attendant may be, or however much excess of fire may be made beyond actual requirements.

From the various modifications given, it will be seen that the same general principle pervades them all, and that the compound gage, made as described, acts essentially the same in all when expanded or contracted. I have shown a variety of modes of application of the same; but it will be readily seen that many other modes of applying my invention and many details of construction may be devised without in the least departing from its spirit, and that the invention is equally applicable for indicating the degree of heat in steam-boilers.

I claim—

1. An automatic damper-controlling apparatus, combined with and located in the oven of a stove or range, and connected by suitable mechanical appliances to a damper, which,

when moved by the action of the heat, will cause an increase or decrease of heat in the oven, as may be desired, substantially as and for the purpose set forth.

2. The sleeve 8, the disk or piece 12, and arm 9, connected to the damper, and arm 6 provided with an adjustable catch or nut, 7, as and for the purpose set forth.

3. The combination, with the thermostat for a stove-pipe, of the shaft 27, eccentric 31, and damper, substantially as described, and as shown in Figs. 5 and 6, and for the purpose set forth.

4. The combination, substantially as described and as illustrated in Fig. 5, of two or more thermostats, whereby their force and motion will be in the same direction, and they will have greater force and length of movement than can be obtained by a single thermostat made of thicker metal.

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