T. S. PRIDEAUX.

Apparatus for Regulating the Supply of Air to Furnaces.

No. 160,466. Patented March 2, 1875.

Fig. 1.

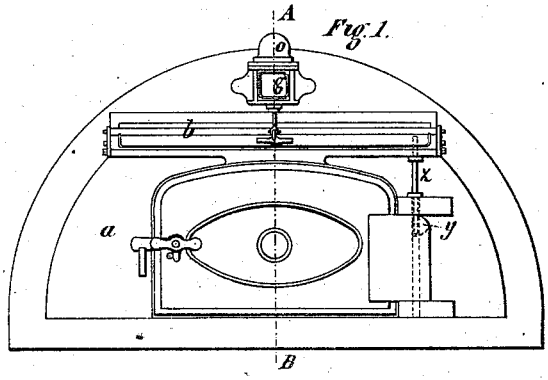


Fig. 2.

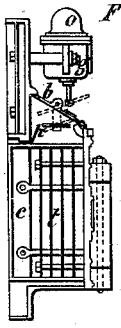


Fig. 3.

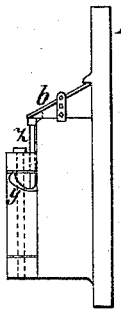


Fig. 6.

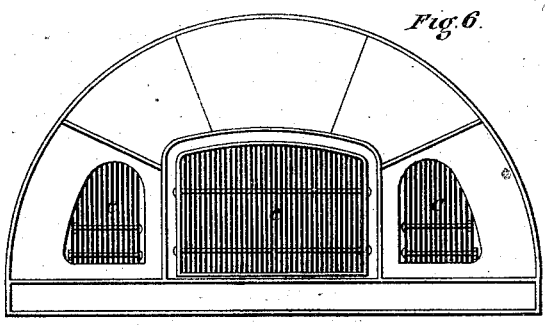


Fig. 7.

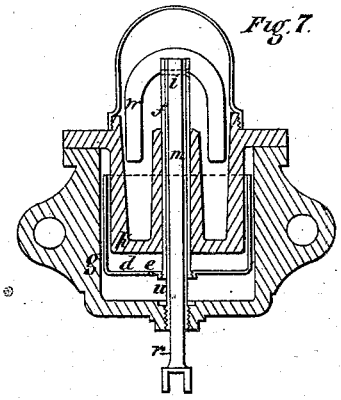


Fig. 4.

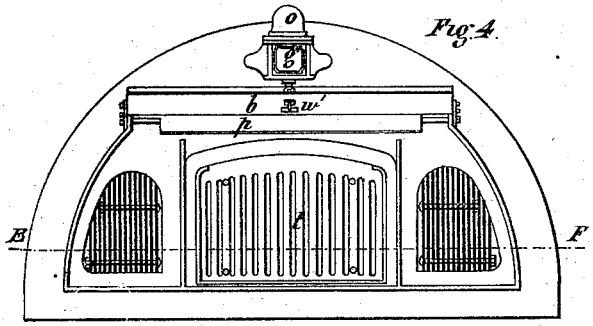


Fig. 8.

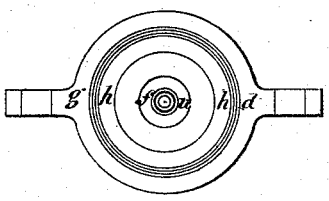


Fig. 5.

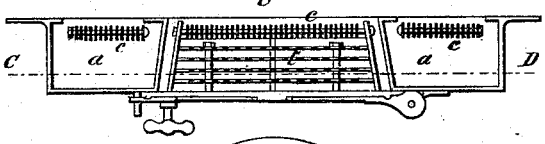


Fig. 9.

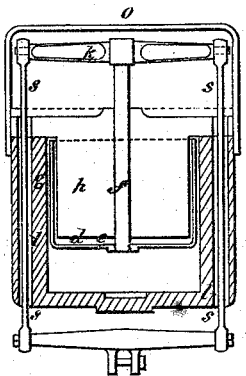
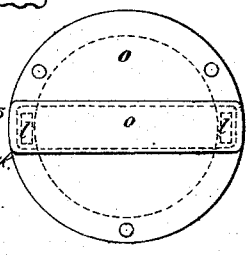


Fig. 10.



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UNITED STATES PATENT OFFICE.

THOMAS S. PRIDEAUX, OF BLACKHEATH, ENGLAND.

IMPROVEMENT IN APPARATUS FOR REGULATING THE SUPPLY OF AIR TO FURNACES.

Specification forming part of Letters Patent No. **160,466**, dated March 2, 1875; application filed December 4, 1874.

To all whom it may concern:

Be it known that I, THOMAS SYMES PRIDEAUX, of Blackheath, Kent, England, have invented Improvements in Apparatus for Regulating the Supply of Air to Furnaces, of which the following is a specification:

This invention relates to apparatus for regulating the supply of air to furnaces in such a manner as to afford the furnace an additional supply of air after coaling, which supply shall gradually diminish and eventually cease after a certain definite period of time by the action of an automatic apparatus, thus securing the cutting off of the additional supply of air, when no longer required, independently of the attention of the fireman.

The apparatus consists of two parts: First, a case or air-chamber in the exterior of the furnace, furnished with a flap or cover moving on an axle, so as to admit or exclude the air at pleasure, and communicating with the interior of the furnace through the fire-door and two channels placed laterally, the exit-mouths of these passages being furnished with grating suitable for heating and distributing the air as it passes into the furnace, and at the same time preventing the radiation of heat outward, while the throat of the air-chamber is furnished with a damper moving on an axle, which, according to the angle its surface makes with the axis of the line of draft, interposes a greater or less impediment to the influx of air, thus affording the means of varying the quantity of the supply according to the character of the fuel and the urgency of the firing. Secondly, a motor-regulator, by which the gradual closing of the lid of the air-chamber is automatically effected. This motor-regulator consists of, first, a cylindrical cup or cistern pierced with a small orifice at the bottom and having a rod rising from its center; secondly, a cast-iron cylinder about one and a half times the depth of the cistern, and sufficiently larger in diameter to admit of the cistern traversing freely within it when the apparatus is charged with mercury, and having a cylindrical block or plunger attached to the under side of the cover, pierced in the center for the passage of the cistern-rod, which plunger is to be of a diameter as much less than the interior of the cistern as will allow of the free passage of the charge of mercury, thus enabling the cistern to be rapidly raised to the top of the cylinder.

The manner in which my said invention is best carried into practice may be fully understood by the aid of the accompanying drawing, which I will now proceed to describe.

Figure 1 shows a front elevation of an apparatus to be applied to the mouth of a furnace, and constructed according to my invention. Fig. 2 is a cross-section of the same through the line A B. Fig. 3 is an end elevation. Fig. 4 is a longitudinal section through the line C D. Fig. 5 is a horizontal section through the line E F, and Fig. 6 is a back elevation of the said apparatus. Figs. 7, 8, 9, and 10 are hereinafter described.

The apparatus works as follows: The charge of mercury is placed in the cistern at the bottom of the cylinder, and the cylinder-cover screwed down. Upon the cistern being raised to the top of the cylinder the plunger enters the cistern, displacing the mercury and causing it to flow over its sides and pass down the circumferential interstice to the bottom of the cylinder. The raising of the cistern is effected by the lifting of the lid of the air-chamber, while the weight of the latter, slightly depressing the cistern, causes the mercury to rise in the circumferential interstice between the cylinder and the cistern to a height considerably above the level of the bottom of the cistern. The mercury, as a consequence, flows into the cistern through the small orifice in a time proportionate to the size of the orifice, the amount of the charge of mercury, and the force of gravity exerted by the suspended weight.

To prevent the access of dust or steam to the interior of the motor-regulator I construct a closed channel, *l*, on each side of the exterior of the cylinder, extending throughout its length, for the passage of the side rods *s* from the cross-head *k*, the cross-head itself being covered with a hood or cup, *o*, the lower edge of which is in apposition with the upper faces of the lateral channels, by which the access of dust or steam is effectually prevented.

An alternative plan for excluding the entrance of dust or steam, compact and elegant in appearance, but entailing slightly more friction and requiring greater delicacy and accuracy in workmanship, is to construct the cis-

tern-rod *f* hollow, so as to enable it to contain within it, and travel freely upon, a small tube, *u*, securely tapped into the bottom of the cylinder.

This tube must be of such a size as to allow of the traverse within it of a small rod, *r*, which may be termed the connecting-rod, attached at its upper end to the top of the cistern-rod (or rather tube) by a pin-joint, *i*, and at its lower to the lid of the air-chamber by a short link.

To enable the motor-regulator to sustain a heavier weight, thus lessening its liability to derangement by friction, and at the same time affording within certain limits the means of varying the time occupied in its descent, I apportion the depth of the plunger *h*, cistern *d*, and cylinder *g* so that the edge of the cistern considerably overlaps the bottom of the plunger. As the velocity with which the quicksilver traverses through the orifice and enters the cistern increases with the pressure, the wider the range of pressure available the greater the power of varying at pleasure, by means of movable weights, the time of the descent of the cistern and the closure of the air-valve.

To prevent the interior of the motor-regulator becoming rusty, thus giving rise to a friction which impairs its action, I heat it in detached pieces to a temperature of about 600° or 700°, and then plunge it into warm linseed-oil, after which it is carefully wiped and then thoroughly washed with benzoline.

a shows the exterior air-case divided into three chambers or passages, *b*, the cover or damper connected by a link to the connecting-rod attached to the cistern-rod of the motor regulator or cylinder *g*. The cover or damper *b* of the air-chamber may be opened by the fireman when he closes the door after coaling, but I prefer to make it self-opening by the aid of the segment of a screw, *y*, formed on the hinge of the furnace-door, which raises a lifting-bar, *z*, upon the door being opened. *c* is the grating for heating and finely dividing the air on its passage into the furnace, and at the same time assisting in conjunction with the plates of sheet-iron *t*, (having vertical slits or openings so placed that the intervals shall not correspond) to prevent the passage of the radiant heat outward. *p* is the flap, the office of which is to vary the size of the neck of the air-chamber. *w'* is a movable weight suspended from the tip of the link, which attaches the connecting-rod to the cover of the air-chamber, and which is furnished with a small hole for the purpose.

Fig. 7 shows a vertical section of the motor-regulator with a hollow cistern-rod. Fig. 8 is a horizontal section of the same. *g* is the cylinder; *d*, the cup or cistern. *h* is the plunger, which displaces the mercury, and causes it to flow over the rim of the cistern into the cylinder when the cover of the air-chamber is raised. *f* is the hollow cistern-rod; *e* the orifice for the passage of the mercury; *u*, the tube, tapped into the bottom of the cylinder; *w*, a weight, advantageously placed to assist by its gravity in overcoming any friction opposing the closing of the apparatus; *o*, the hood or cap for excluding dust and steam. *m* is the connecting-rod, and *i* its pin-joint. Fig. 9 shows a vertical section of the motor-regulator, with a cross-head and closed channels for the passage of the side rods. Fig. 10 is a view of the same, seen from above, showing the hood or cap, and the channels for the passage of the side rods. *g* is the cylinder; *d*, the cup or cistern; *h*, the plunger; *f*, the cistern-rod; *e*, the orifice for the passage of the mercury; *o*, the hood or cap for excluding dust and steam; *k*, the cross-head; *s*, the side rods, and *l* the channels for the passage of the side rods.

I claim as my invention—

1. In combination with the furnace-door and movable damper *b p*, the screw-segment *y*, forming a part of the door and the lifting-rod *z*, the segment being adapted, when the door is opened, to lift the rod and move the damper, as described.

2. The combination of the furnace-door, having the segment *y*, as described, the lifting-rod *z*, the movable damper *b*, and the motor-regulator *o g*, the damper being opened by the movement of the door, as described, and closed by the operation of the regulator, substantially as set forth.

3. The combination of the receiving-cylinder *g*, the cistern *d*, having the hole *e* and the plunger *h*, substantially as described.

4. The combination of the grating *c c c* and the dampers *b p*, the grating being adapted to heat and distribute the air received through the damper, substantially as described.

5. The combination of the cylinder *g*, cistern *d*, plunger *h*, cistern-rod *f*, connecting-rod *i*, and weight *w*, as and for the purpose described.

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Witnesses:
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