INVENTION

The Franklin Stove

"A Classic Invention"

This First Down-Draft Stove is Still a Good Design for "The Gentleman Who is Able to Manage his Own Fire"

Description of a new STOVE for burning of Pitcoal, and consuming all its smoke. By Dr. B. Franklin. In PHILOSOPHICAL AND MISCELLANEOUS PAPERS, lately written by B. Franklin. London: Printed for C. Dilly, in the Poultry, M. DCC. LXXXVII (1787).

TOWARDS the end of the last century an ingenious French philosopher, whose name I am sorry I cannot recollect, exhibited an experiment to show that very offensive things might be burnt in the middle of a chamber, such as woolen rags, feathers, &c., without creating the least smoke or smell. The machine in which the experiment was made, if I remember right, was of this form, made of plate iron. *(Figure 1).* Some clear-burning charcoals were put into the opening of the short tube A, and supported there by the grate B. The air, as soon as the tubes grew warm, would ascend in the longer leg C, and go out at D, consequently air must enter at A descending to B. In this course it must be heated by the burning coals through which it passed, and rise more forcibly in the longer tube, in proportion to its degree of heat or rarefaction, and length of that tube. For such a machine is a kind of inverted syphon: and as the greater weight of water in the longer leg of a common syphon, in descending, is accompanied by an ascent of the same fluid in the shorter; so, in this inverted syphon, the greater quantity of levity of air in the longer leg, in rising, is accompanied by the descent of air in the shorter. The things to be burned being laid on the hot coals at A, the smoke must descend through those coals, and be converted into flame, which, after destroying the offensive smell comes out at the end of the longer tube as mere heated air.

Whoever would repeat this experiment with success, must take care that the part A, B, of the short tube be quite full of burning coals, so that no part of the smoke may descend and pass by them without going through them, and being converted into flame; and that the longer tube be so heated as that the current of ascending hot air is established in it before the things to be burnt are laid on the coals; otherwise there will be a disappointment.

It does not appear, either in the Memoirs of the Academy of Sciences, or Philosophical Transactions of the English Royal Society, that any improvement was ever made of this ingenious experiment, by applying it to useful purposes. But there is a German book, entitled *Vulcanus Famulans,* by Joh. George Leutmann, P.D. printed at Wirtemberg in 1723, which describes, among a great variety of other stoves for warming rooms, one which seems to have been formed on the same principle, and probably from the hint thereby given, though the French experiment is not mentioned. . . .

Leutmann Not Inventor

It appears to me by Mr. Leutmann's explanation of the operation of this machine, that he did not understand the principles of it, whence I conclude he was not the inventor of it; and by the description of it, wherein the opening at A is made so large, *(Figure 2D)* and the pipe E, D, so short, I am persuaded he never made nor saw the experiment; for the first ought to be much smaller, and the last much higher, or it will hardly succeed. The carrying it in the kitchen, too, every time the fire should happen to be out, must be so troublesome, that it is not likely ever to have been in practice, and probably has never been shown but as a philosophical experiment. The funnel for conveying the vapor out of the room would besides have been uncertain in its operation, as a wind blowing against its mouth would drive the vapor back.

The stove I am about to describe, was also formed on the idea given by the French experiment, and completely carried into execution before I had any knowledge of the German invention; which I wonder should remain so many years in a country where men are so ingenious in the management of fire, without receiving long since the improvements I have given it.

A, the bottom plate *(Figure 2),* which lies flat upon the hearth, with its partitions 1, 2, 3, 4, 5, 6, that are cast with it, and a groove Z Z, in which are to slide the bottom edges of the small plates Y, Y, figure 12; which plates meeting at X close the front.

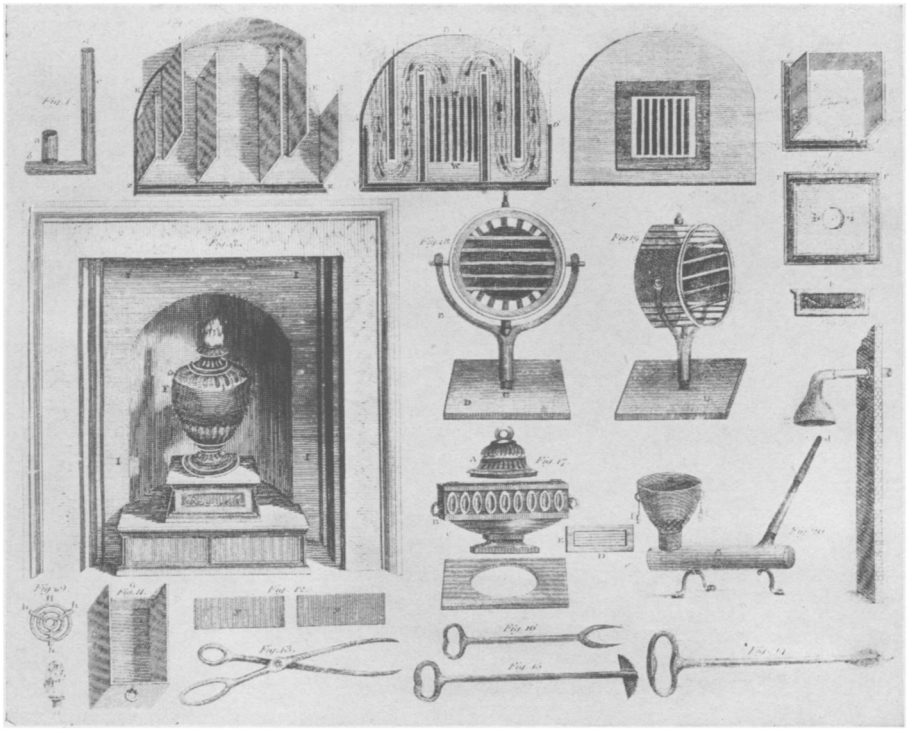
B 1, figure 3, is the cover plate showing its under side, with the grooves 1, 2, 3, 4, 5, 6, to receive the top edges of the partitions that are fixed to the bottom plate. It shows also the grate W W, the bars of which are cast in the plate, and a groove V V, which comes right over the groove Z Z, figure 2, receiving the upper edges of the small sliding plates Y Y, figure 12.

B 2, figure 4, shows the upper side of the same plate, with a square impression or groove for receiving the bottom mouldings T T T T of the three-sided box C, figure 5, which is cast in one piece.

D, figure 6, its cover, showing its under side with grooves to receive the upper edges S S S of the sides of C, figure 5; also a groove R, R, which when the cover is put on come right over another Q Q in C, figure 5, between which it is to slide.

E, figure 7, the front plate of the box.

P, a hole three inches diameter through the cover D, figure 6, over which hole stands the vase F, figure 8,



THE FRANKLIN STOVE

And its several parts, with the implements necessary for its use. From Franklin's original account of his invention.

which has a corresponding hole two inches diameter through its bottom.

The top of the vase opens at O, O, O, figure 8, and turns back upon a hinge behind when coals are to be put in; the vase has a grate within at N N of cast iron H, figure 9, and a hole in the top one inch and a half diameter to admit air, and to receive the ornamental brass gilt flame M, figure 10, which stands in that hole, and, being itself hollow and open, suffers air to pass through it to the fire.

G, figure 11, is a drawer of plate iron, that slips in between in the partitions 2 and 3, figure 2, to receive the falling ashes. It is concealed when the small sliding plates Y Y, figure 12, are shut together.

I, I, I, I, figure 8, is a niche built of brick in the chimney and plastered. It closes the chimney over the vase, but leaves two funnels, one in each corner, communicating with the bottom box K K, figure 2. . . .

Let the first fire be made after eight in the evening, or before eight in the morning, for at those times and between those hours all night, there is usually a draft up a chimney, though it has long been without fire; but between those hours in the day there is often in a cold chimney a draft downwards, when, if you attempt to kindle a fire, the smoke will come into the room.

But to be certain of your proper time, hold a flame over the air-hole at the top. If the flame is drawn strongly down for a continuance, without whiffling, you may begin to kindle a fire.

First put in a few charcoals on the grate H.

Lay some small sticks on the charcoals.

Lay some pieces of paper on the sticks.

Kindle the paper with a candle.

Then shut down the top, and the air will pass down through the air-hole: blow the flame of the paper down through the sticks, kindle them, and their flame passing lower, kindles the charcoal.

When the charcoal is well kindled, lay on it the sea-coals, observing not to choak the fire by putting on too much at first.

Flame Descends

The flame descending through the hole in the bottom of the vase, and that in plate D into the box C, passes down farther through the grate W W in plate B 1, then passes horizontally towards the back of the chimney; there dividing, and turning to the right and left, one part of it passes round the far end of the partition 2, then coming forward, it turns round the near end of partition 1, then moving backward, it arrives at the opening into the bottom of one of the upright corner funnels behind the niche, through which it ascends into the chimney, thus heating that half of the box and that side of the niche. The other part of the divided flame passes round the far end of partition 3, round the near end of partition 4, and so into and up the other corner funnel, thus heating the other half of the box, and the other side of the niche. The vase itself, and the box C, will also be very hot, and the air surrounding them being heated, and rising, as it cannot get into the chimney, it spreads in the room; colder air succeeding is warmed in its turn, rises and spreads, till by the continual circulation the whole is warmed.

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ENTOMOLOGY-GENETICS

Insect Species Produce Families all of Same Sex

INSECTS that produce families of only one sex, instead of the ordinary half-male, half-female ratio, have been studied by Dr. C. W. Metz at the Johns Hopkins University. They belong to the genus Sciara, which is a tiny insect related to flies and mosquitoes.

In his endeavor to find the reason for this strange state of affairs, Dr. Metz has made microscopic examination of the chromosomes in the germ-cells of his insects. He finds that the male reproductive cells apparently are able to transmit either maleness or femaleness to the offspring. The sex determination, excluding either males or females completely from the progeny of a given mother, must therefore take place in the body of the mother insect. But just what the mechanism of this determination may be, it has not yet been possible to discover. Dr. Metz, who is also associated with the department of genetics of the Carnegie Institution of Washington, will have his results published in the forthcoming issue of *The Quarterly Review of Biology*.

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