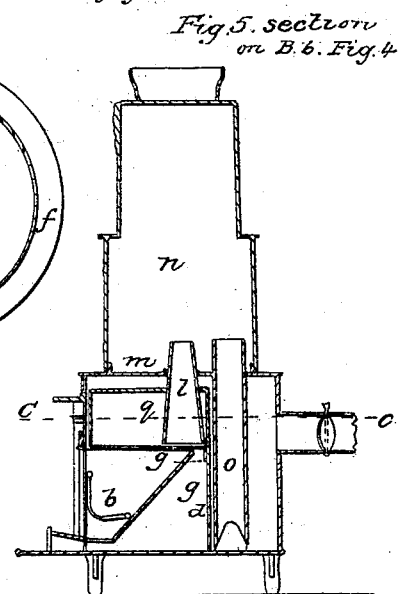
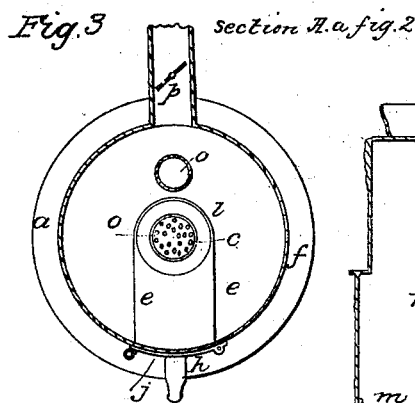
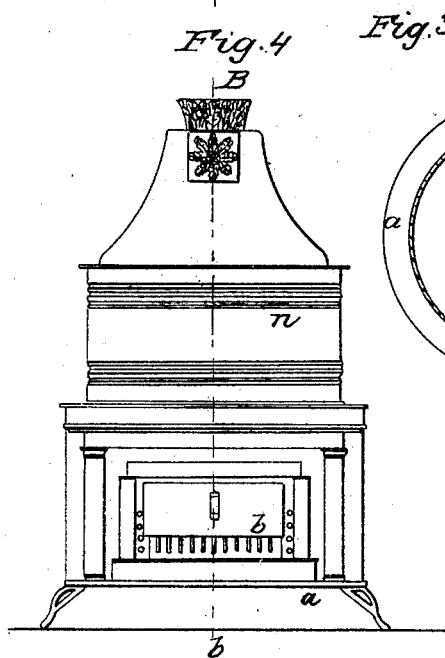
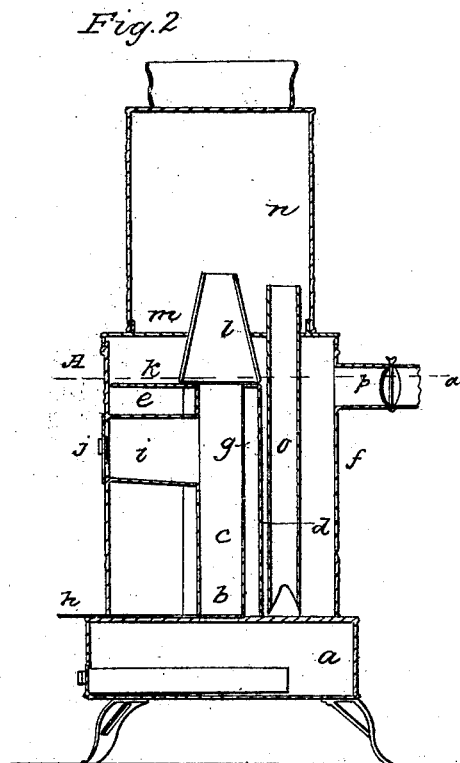
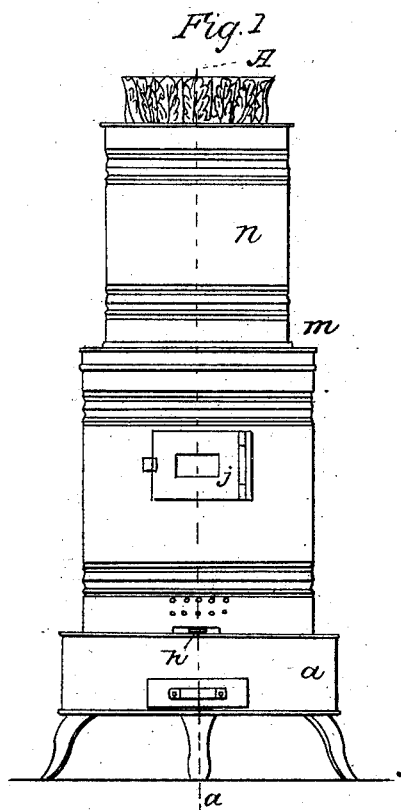


SHIELDS & COLE.
Hot Air Furnace.

2 Sheets—Sheet 1.

No. 6,156.

Patented March 6, 1849.



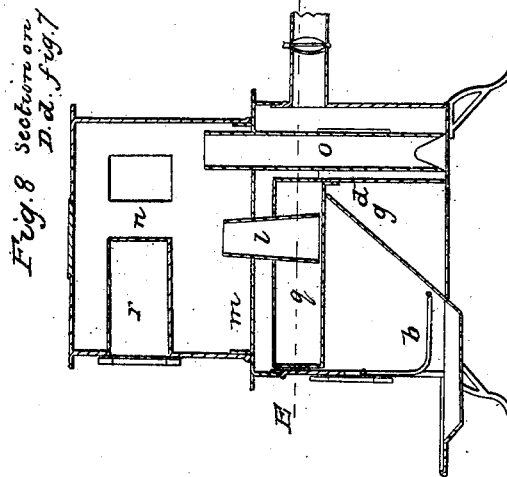
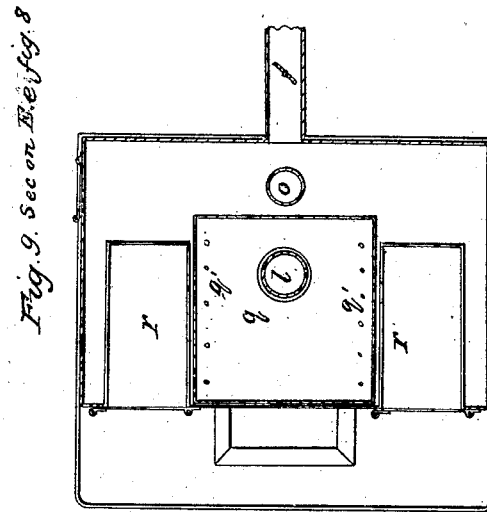
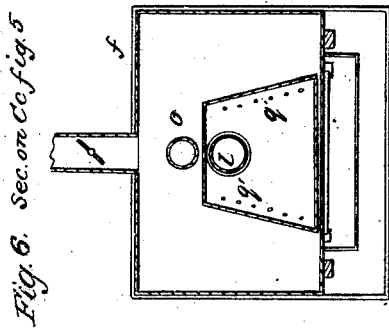
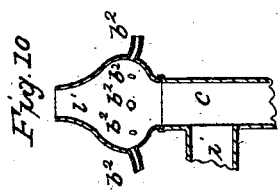
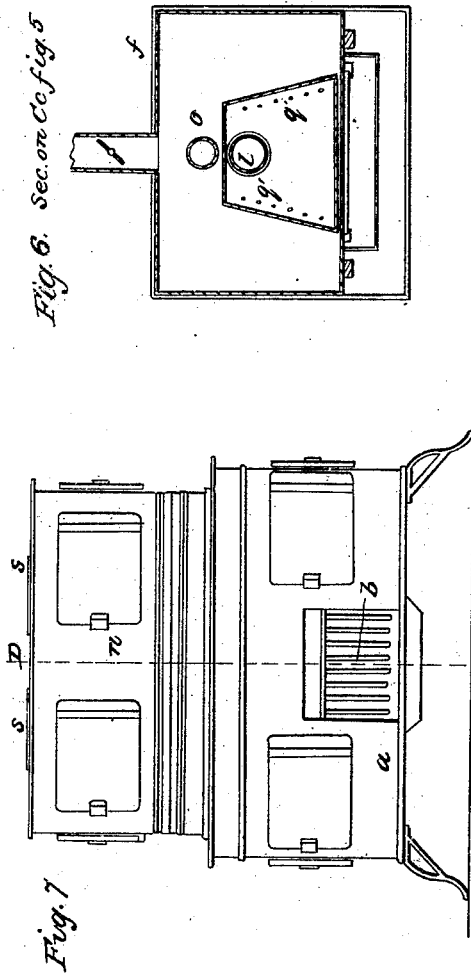
SHIELDS & COLE.

2 Sheets—Sheet 2.

Hot Air Furnace.

No. 6,156.

Patented March 6, 1849.



UNITED STATES PATENT OFFICE.

JAMES SHIELDS, OF NEW YORK, N. Y., AND JAMES COLE, OF CINCINNATI, OHIO.

STOVE FOR HEATING APARTMENTS.

Specification of Letters Patent No. 6,156, dated March 10, 1849.

To all whom it may concern:

Be it known that we, JAMES SHIELDS, of the city, county, and State of New York, and JAMES COLE, of Cincinnati, in the
5 county of Hamilton and State of Ohio, have invented new and useful improvements in the management of combustion for heating purposes, whether applied to close stoves, open fireplaces, or furnaces, or grates, for
10 heating apartments or buildings, cooking, baking, and all other purposes to which the same are applicable, and that the following is a full, clear, and exact description of the principle or character which distinguishes
15 them from all other things before known and of the manner of making, constructing and using the same, reference being had to the accompanying drawings, making part of this specification, in which—

20 Figure 1 is an elevation of a close stove on our improved plan; Fig. 2, a vertical section thereof, and Fig. 3, a horizontal section of the same at the line (A, *a*) of Fig. 2; Fig. 4, is a front elevation of our open
25 fire grate adapted to our improved method of managing combustion; Fig. 5, a vertical section thereof taken at the line (B, *b*) of Fig. 4; and Fig. 6, a horizontal section of the same taken at the line (C, *c*) of Fig. 5;
30 Fig. 7 is a front elevation of a cooking stove, or range with our improvements applied to it; Fig. 8, a vertical section thereof taken at the line (D*d*) of Fig. 7; and Fig.
35 9, a horizontal section of the same taken at the line (E*e*) of Fig. 8, and Fig. 10, a vertical section of the throat.

The nature of the first part of our invention consists in combining the chamber of combustion, in which the fuel of any desired
40 kind is burned with a drum or chamber for the combustion and circulation of the inflammable matter evolved from the combustion of the fuel, by means of what we term a "throat" through which the products of
45 combustion pass from the chamber of combustion to be inflamed in the said throat and drum.

The second part of our invention consists in admitting a jet or jets of atmospheric air
50 to the throat which forms the communication between the chamber of combustion and a drum or furnace chamber that the inflammable gases evolved from the combustion of the fuel in the fire chamber may be mingled
55 with the atmospheric air in their passage through the throat, and be thereby in-

flamed and pass, in an inflamed and inflaming state, into the drum, or heating or working chamber of a furnace that the flame may circulate beyond the
60 throat and then return to the exit pipe which in a vertical apparatus is placed below upper aperture of the throat, the equivalent position being retained when the position of the apparatus is changed this ar-
65 rangement preventing the flame from taking a direct course from the throat to the discharge pipe.

The third part of our invention consists in making the lower aperture of the throat
70 larger than the upper aperture thereof that the inflammable gases and atmospheric air may be the better commingled in their passage through the throat, and thereby insure a more perfect combustion.
75

The fourth part of our invention consists in making the throat with an enlargement between the lower and upper apertures that the gases that enter the throat from the
80 chamber of combustion may have room to mingle with the supply of atmospheric air before they pass up and out of the smaller aperture above into the drum.

In Figs. 1, 2, 3 and 10 of the accompanying drawings (*a*) represents the hollow base
85 of a stove made in the usual or any other desired manner, on the top plate of which is placed the grate (*b*), surrounded by the vertical fire pot (*c*) made of metal or some refractory earthy substance, the capacity of
90 which is to be determined by the quantity of fuel which it is intended to contain. The fire pot is surrounded by a casing (*d*) the back of which is semi-cylindrical, and the sides (*e*, *e*) tangential thereto, and extend-
95 ing to and united at front with the outer radiating chamber (*f*). The said casing forms an air chamber (*g*) around the fire pot into which air is admitted through holes in front, governed by a register (*h*) in
100 front to regulate the supply of air which in passing through this chamber is highly heated by the fire pot and the surrounding casing which receives its heat in manner to be presently described. A feeding tube (*i*)
105 extends from the radiating cylinder to the fire pot through which the fuel is supplied, and this of course provided with a door (*j*) in the usual manner. The air chamber which surrounds the fire pot is covered over
110 in part by a cap plate (*k*), leaving an annular opening extending all around the up-

per end of the fire pot, and to this is fitted the larger end of a funnel shaped tube (*l*), called "the throat," attached about the middle of its length to the cap plate (*m*) of the radiating cylinder; and to the upper surface of this plate is fitted a cylindrical drum (*n*) into which the smaller end of the throat opens. The upper end of the throat is of less diameter than the upper end of the fire pot which constitutes the lower aperture of the throat. But the throat may be made in the form represented at (*l'*) Fig. 10 with an enlargement between the upper and lower apertures provided with tubes for admitting air as at (*l''*). Back of the throat the cap plate (*m*) is provided with a vertical pipe (*o*) that extends down some distance into the radiating cylinder which is provided with an exit pipe (*p*) leading to the chimney for carrying off the products of the final combustion. The gases evolved from the combustion fuel in the fire pot or chamber of combustion, as well as by the distillation thereof, pass up into the throat, and there mingle with the heated atmospheric air from the chamber surrounding the fire pot, and in passing up through the upper aperture of the throat, which is contracted, the inflammable gases and atmospheric air are caused to commingle thoroughly and to inflame, and while burning pass up into the drum and toward the top thereof, and then descend, giving out heat to the entire surface of the drum; the products of this combustion then descend through the pipe (*o*) into the radiating cylinder, and out through the exit pipe (*p*) to the chimney, the circulation of the heated products of the combustion giving out heat to the radiating cylinder, and to the casing that surrounds the fire pot to aid in heating the supply of air that passes through this chamber to supply the combustion of the inflammable gases in the throat and drum. The top plate of the radiating cylinder, to which the throat is attached, and which constitutes a diaphragm to divide the drum from the space between the radiating cylinder and the air chamber, may be dispensed with in whole or in part, thus constituting the space within the radiating cylinder a part of the drum, or rather a continuation thereof, in which case the throat must be attached to the casing that surrounds the fire pot.

The form of the stove and the arrangement of its various parts may be varied at pleasure to suit the fancy of the manufacturer or public taste, so long as the principles of our invention are retained.

The application of the principles of our invention to open fire grates is represented in Figs. 4, 5, and 6, in which the parts corresponding with those of the close stove above described are indicated by the same letters. In this, the air chamber (*g*) only

extends around the back and sides of the grate, the air being admitted through holes governed by a register in any desired manner. And this air chamber and the top of the fire chamber are covered by an air chamber (*q*) into which the air passes from the chamber around the back and sides of the grate, through holes (*q'*) and after being highly heated therein passes into the throat through a space (*g'*) left between the lower plate of the chamber (*q*) and the lower edge of the funnel which is attached to the upper plate of the said chamber (*q*), and a part of the lower apertures of the funnel extends over the air chamber (*q*) at the back of the grate, so that a portion of heated air will enter the throat through the lower aperture of the funnel, and thus induce a more thorough mingling of the combustible gases with the supporter of combustion.

It will be seen by reference to the drawing that this grate resembles the closed stove above described except in the form, in the substitution of an open grate for a closed fire chamber, and in the arrangement of the air chamber, and the mode of admitting heated air to the throat. And it will also be evident that the plate which divides the drum from the outer casing of the body of the stove can be dispensed with in this as in the other example.

In Figs. 7, 8, and 9, which represent our improvements as applied to cooking stoves or ranges, it will be seen that all the parts are arranged in the same manner as in Figs. 4, 5, and 6 above described except that the outer casing of the stove and the drum are larger in proportion to give ample room for ovens (*r*) and other cooking utensils, and for boiler holes (*s*) which may be disposed in any manner desired. The ovens, boilers, and other cooking utensils are made to project within the body of the stove and drum that the flame produced by the inflammation of the products of combustion, and the heated products of their combustion may play and circulate all around and heat them. These various utensils may be disposed of and multiplied at pleasure and to a much greater extent than in ordinary cooking stoves in consequence of the body of flame produced within the drum. For stoves applied to culinary purposes we prefer to dispense with the diaphragm or horizontal partition which separates the drum from the body of the stove, the better to distribute the heat around the ovens and other culinary utensils. It will however be obvious that for cooking stoves and ranges the closed fire chamber may be used as well as the open grate, although we prefer the open grate. And whether for cooking, baking, or heating apartments or buildings, the fire chamber may be adapted to the burning

of wood as well as coal, although our experiments have principally been made with reference to the use of coal as much more economical.

5 Our several improvements may be used separately from one another and produce some of the advantages contemplated, but it will be found that when all of them are combined the best effects contemplated by
10 us will be attained.

We have described and represented the modes of making the throat and supplying air thereto which we have assayed and found by experiment to be the best adapted to the contemplated purpose, but it will be obvious that the form of the parts constituting the throat and the mode of admitting atmospheric air thereto may be modified at pleasure without changing the principle of our invention; as for instance, instead of the inverted funnel the throat may consist of two short tubes or rings of different diameter, the small one above and the large one below and surrounding the lower
25 edge of the small one, thus leaving an annular aperture all around for the admission of atmospheric air; or these rings may be perforated with holes communicating with the hot air chamber; or a tube may pass
30 into the center of the throat to supply atmospheric air to the center of the throat so as to act on the principle of the well known argand lamp, and this latter may be used alone or in combination with the supply of
35 air around the periphery of the throat. And as to the supply of atmospheric air it can be introduced through any desired part of the stove into a chamber there to be heated in any desired manner, and in
40 fact the air may be conducted directly from the room to the throat by tubes or passages, although this will not be so effective as if carried through a chamber so disposed and arranged as to heat the air to a
45 high temperature before it enters the throat as it is a fact well established in science that highly heated atmospheric air is a better supporter of combustion, particularly for the combustion of inflammable gases, than
50 cold atmospheric air; in short any modification of mere form and arrangement may be adopted that will not involve a change in

the principle of our invention as pointed out above.

We have described our method of managing the combustion of fuel as applied for closed and open stoves or fire places for heating apartments, and for cooking; but it will be evident that the same thing is applicable to the generation of heat for a
60 variety of purposes, such as hot air furnaces, heating kettles for evaporating saccharine juices, dyers' kettles, steam boilers, boilers such as are used on board of whaling
65 ships, puddling and other furnaces for metals and a multitude of other purposes not necessary to enumerate, in which economy of fuel, the diffusion of flame and heat, and the absence of smoke is desired.

What we claim as our invention and desire to secure by Letters Patent is—

1. Admitting atmospheric air to the throat which forms the communication between the chamber for the combustion of the fuel and the drum, that the inflammable gases evolved from the combustion of the fuel in the fire chamber may be mingled therewith in passing through the said throat, and be thereby effectually inflamed, and pass in an inflamed and inflaming state
80 into the drum, as described.

2. We claim making the lower aperture of the throat, that forms the communication between the fire chamber and drum, larger than the upper aperture thereof, substantially as described, that the inflammable gases and atmospheric air may be the better commingled in their passage through the throat, and thereby insure a more perfect combustion, as described.
90

3. And finally, we claim making the said throat, substantially as above described, with an enlargement between the upper and lower apertures thereof, that the gases that enter the said throat may have room to
95 mingle with the supply of atmospheric air before they pass up and out of the smaller aperture above into the drum, as described.

JAMES SHIELDS.
JAMES COLE.

Witnesses:

JOSEPH HASTINGS,
ALEX. MILLAR.