2 Sheets—Sheet 1.

P. P. STEWART.

Coal Stove.

No. 48,143. Patented June 6, 1865.

Fig. 1

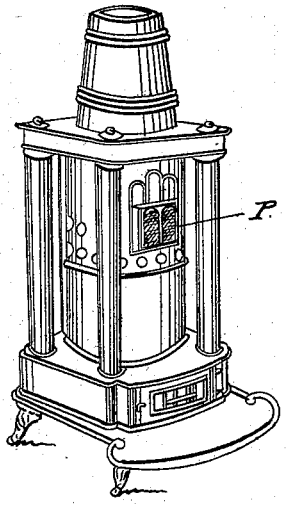


Fig. 2

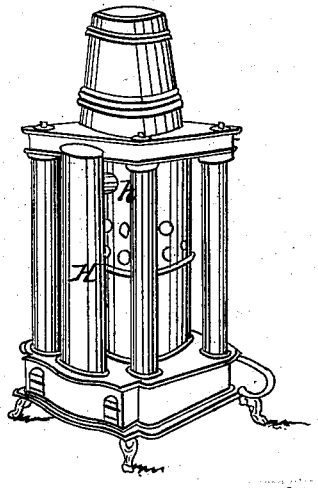


Fig. 3

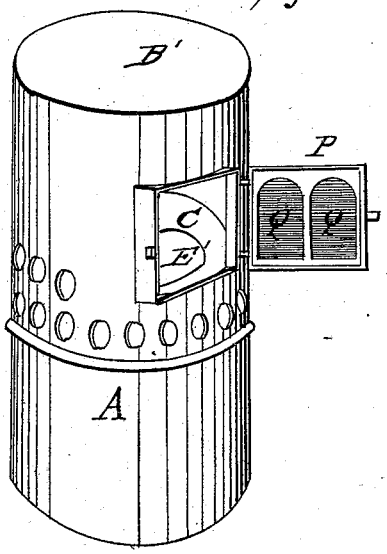
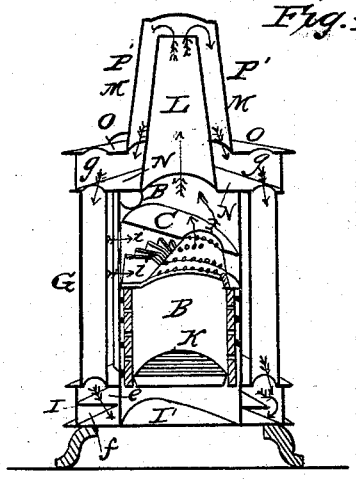


Fig. 4



Witnesses
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2 Sheets—Sheet 2.

Coal Stove.

No. 48,143.

Patented June 6, 1865.

Fig. 3

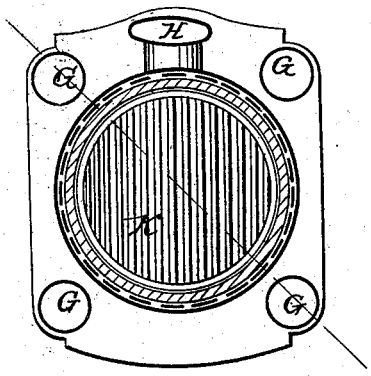


Fig. 5

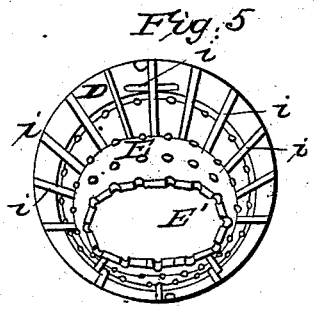


Fig. 6

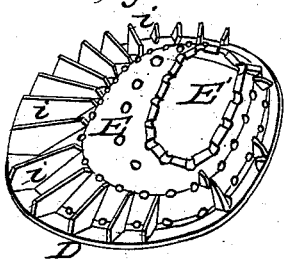
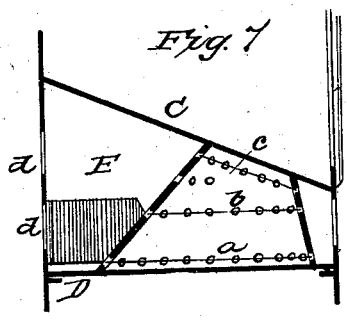


Fig. 7



Witnesses

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Marcus P. Norton

Inventor

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UNITED STATES PATENT OFFICE.

PHILO P. STEWART, OF TROY, NEW YORK.

IMPROVEMENT IN COAL-STOVES.

Specification forming part of Letters Patent No. **48,143**, dated June 6, 1865.

To all whom it may concern:

Be it known that I, PHILO P. STEWART, of the city of Troy, county of Rensselaer, and State of New York, have invented certain new and useful Improvements in Bituminous-Coal Burners or Coal-Stoves, for the purpose of facilitating the consumption of the gases and smoke evolved from the burning of bituminous or other coal containing quantities of gaseous and smoky matter; and I do hereby declare that the following is a full, clear, and exact description of the nature, construction, and operation of the same, reference being hereby had to the accompanying drawings, and to the letters of reference marked thereon, which said drawings make a part of this specification.

Figure 1 is a front perspective view of the said coal-burner or coal-stove. Fig. 2 is a rear perspective view of the same stove. Fig. 3 is a cross or horizontal section on upper surface of the fire-grate, and showing the openings by which the corner or cylinder flues communicate with the flues in the base, and hereinafter more fully described. Fig. 4 is a vertical section on the line *x* and *y*, Fig. 3, through the corner or cylinder flues, and showing the construction and arrangement of the perforated capping tube or device, with its surrounding cold-air chamber, and immediately at the top of and over the fire-pot or chamber of combustion, all of which is more fully described hereinafter. Fig. 5 is a front top view, or view looking downward from the front of the stove and upon the said perforated capping tube or device, fully described hereinafter. Fig. 6 is a side top view, or a top view from the side looking downward upon the said perforated capping tube or device shown at said Fig. 5. Fig. 7 is a vertical section of the said capping tube or device, on a line through the center of the same from front to rear, and showing the construction of the same, in the manner as hereinafter described and set forth. Fig. 8 is a perspective view of the cylinder surrounding the fire-chamber and the chamber above the said capping tube or device, and containing the door, with wire-gauze therein, each constructed, arranged, and combined in the manner and for the purposes herein described and set forth.

The nature of my said invention and improvements consists in the employment of a capping or surmounting perforated tube or device, with a surrounding chamber, and placed immediately upon and over the top of the fire-pot or chamber of combustion, whereby and by means of which atmospheric air is admitted to the fire-chamber over the burning fuel through numerous apertures, and in its coldest possible condition, so that when the same shall come in contact with the escaping gases and smoke evolved from the burning fuel in the combustion-chamber below the same shall be arrested and burned or consumed, or as nearly so as possible, thereby economizing in the use of bituminous or like coal, and at the same time prevent, in a great measure, the choking or filling up of the flues of the stove or burner, and the exit-pipe leading to the chimney by a more perfect combustion and consumption of such gases and smoke.

It also consists in the employment of a wire-gauze door, in combination with the perforated cap or tube through which atmospheric air is admitted in jets in the coldest possible condition, at the same time admitting atmospheric air through the said wire-gauze door, in the manner and for the purposes substantially as herein described and set forth.

It also consists in the employment and arrangement of the said perforated cap or tube in parts or sections, in the manner and for the purposes herein described and set forth.

It also consists in the employment of vertical chambers or cylindrical tubes immediately above the radiating-chamber, into which opens the said wire-gauze door, and immediately above the top of the stove, so as to obtain a greater amount of radiating-surface, and to aid in the combustion of the gases and smoke, in and by the means of the said perforated cap or tube, and each more fully hereinafter described and set forth.

It also consists in the employment of a horizontal return-flue in the base of the stove, in combination with vertical radiating tubes or pipes leading from the chamber in the base of the stove to the radiating-chamber immediately above the said perforated cap or device, by means of which cold atmospheric air is admitted to the smoke and gases evolving from the burning fuel in the combustion-chamber, as herein specified. There may be four or more such vertical pipes or tubes. I have, however, found by experiment that four such tubes are

sufficient for all practical purposes, one at each corner of the base of the stove or burner.

I have found by actual experiments that atmospheric air admitted in its coldest possible condition to the burning bituminous or other like or soft coal in the chamber of combustion, and to the gases and smoke evolved or evolving therefrom, is much the best for the more perfect combustion and consumption of the gases and smoke evolved or arising from soft or bituminous coal than hot or heated air. I have therefore so constructed my said stove or coal-burner as to admit the air in as cold a state or condition as possible, and also to admit it in such places and in such manner as to secure a more perfect admixture of the same with the smoke and gases, thereby attaining a more perfect combustion and greater economy in the use of bituminous or like or soft coal. This I have ascertained after many and repeated experiments, at great expense in time and money, and after such experiments I have succeeded in attaining the desired results in the manner and by the means herein described and set forth, as well as fully shown in the accompanying drawings.

Having thus described the nature of my said invention and improvements, I will here proceed to describe the construction and operation thereof, which is as follows, to wit:

A is the cylinder surrounding the fire-brick of the chamber of combustion, and may be of sheet or cast iron. This cylinder may be of any diameter and height deemed best. Between this cylinder and the fire-brick I construct an air-chamber, which communicates with the sides of the burning fuel by means of numerous apertures; but having obtained a patent upon such device, dated on the 28th day of April, 1863, I do not deem it best here to describe the same further. This cylinder is placed upon the top surface of the base of the stove. Upon the top of this cylinder and the fire-brick B therein I place the perforated cap and tube E, Figs. 4, 5, and 6. This cap and tube I construct of cast-iron or of fire-brick, and in size to correspond to the size of the stove, furnace, or place where the same is to be used. This cap is constructed with a lower plate, D, Figs. 4, 5, 6, and 7, and with an upper plate, C, Figs. 4, 7, and 8. Between these plates I construct the perforated tube or device E, Figs. 4, 5, 6, and 7. The upper plate, C, may be inclined upon any angle deemed best, and may be of any suitable material. The perforated tube or device E may be cast in sections, vertical or horizontal, in order to form the perforations or apertures. It will be seen at Figs. 5, 6, and 7 that this said perforated cap or tube is made in four parts or sections on the lines *a b c*, more readily seen at Fig. 7. The perforations indicated by small circles in said figures are made between the joining of said respective sections or parts, and at the time of making or casting the said sections or parts, or such perforations may be made by drilling the same with some suitable instrument for that purpose. This tube thus constructed, or constructed in any manner substantially the same, I place upon the top or upper part of the fire-chamber, and which is much larger at its bottom or lower part than at its upper part, as shown at Figs. 4, 5, 6, and 7. This is for the purpose of receiving the smoke and gases evolving from the burning fuel below, and so confining the same, as they pass upward, as to allow a sufficient quantity of cold atmospheric air to be admitted to and mixed therewith in a most thorough manner, and thereby causing a more perfect combustion and consumption of such smoke and gases than by any other known means or device. I make the said perforated tube or cone E of cast-iron or other suitable material, and perforate the same with any required number and size of openings or apertures for the admission of atmospheric air in as cold condition as may be to the said smoke or gases, as aforesaid. Through this tube or cone E the fire is supplied with fuel, as seen at E′, Figs. 5, 6, and 8, and through it also passes the direct and circuitous draft, so that the smoke and gases unconsumed in the fire and fire-chamber below must pass upward and into the said perforated tube or cone, when the same come in contact with the cold air entering therein through the said perforations or openings.

F, Figs. 4 and 7, is a space or chamber between the said upper and lower plates, C and D. The cold air passes into this space from the room where the said stove is used through large openings *d d*, Fig. 7, in and through the outer and sheet-iron casing, A, as shown at Figs. 1, 2, and 8. These openings should be made large enough, so as to freely admit the atmospheric air to the said perforated tube or cone without confining it, and thereby heating the same before it enters the conical space or throat formed by means of the said perforated tube or cone E. The said chamber F is much larger in the rear part thereof than upon the front or sides of the same, as is fully shown at Figs. 4 and 7.

B′, Figs. 4, 7, and 8, is the upper or radiating chamber, which communicates with the return-flues *e* and *f*, in the base of the stove, as seen at Fig. 4, by means of the vertical radiating tubes or columns G G, Figs. 3 and 4, and fully appearing in perspective at Figs. 1 and 2. These tubes or columns may be of any size deemed best, and of sheet or cast-iron. Their height will, of course, correspond to and with the distance between the top of the said base and the under-side or horizontal flue, *g*, Fig. 4, which is closed by a top plate, as shown at Figs. 1 and 2.

I, Fig. 4, is a horizontal division-plate, whereby is formed the return-flues *e* and *f*, Fig. 4.

I′, Fig. 4, is the ash pit or chamber.

K, Figs. 3 and 4, is the fire-grate.

H, Figs. 2 and 3, is the exit-pipe, which extends downward through the back part of the

said plate I, as shown at Fig. 4, and of course communicates with the lower flue, *f*, Fig. 4.

h, Fig. 2, is a short exit-pipe, communicating with the said upper chamber, B′, Figs. 2 and 4, and with the upper part of the said vertical exit-pipe H, as seen at Fig. 2.

N, Fig. 4, is a plate of any desired thickness, and placed immediately upon and over the top of the said radiating-chamber B′, and separating such chamber from the said horizontal flue *g*, same figure. At or near the center of this division-plate N, I construct an opening of any desirable size. Around and upon such opening I place the vertical inner tube, L, same figure, which I usually construct in a conical or tapering form, and which is, of course, somewhat smaller at the top than at its lower end resting upon said division-plate N. This inner vertical tube may be of any diameter and height deemed best. It may also have perpendicular or parallel sides, thereby making the upper end of the same size as that of the lower end. I prefer, however, to have the upper end of less diameter than that of the lower end. The upper end of this tube L contains an opening which communicates with the surrounding chamber. The surrounding chamber is formed by means of the vertical outer tube or casing, M, Fig. 4, which rests upon the upper surface of the top plate, O, of the stove, as seen at Fig. 4. The opening through said top plate, O, is made to correspond to and with the size of the lower end of the said surrounding tube M, Fig. 4. There is thus and thereby formed a space or chamber, P′ P′, Fig. 4, between the said inner tube, L, and outer tube or surrounding case, M M. This outer tube or case extends above the top of the said inner tube, L, far enough to form an opening or space for the passage of the heat or heated air, as hereinafter described. The said inner and outer tubes may be made of sheet or cast iron, and the outer one may be ornamented, &c. In the said short pipe is located a damper, which is for the purpose of giving the direct or circuit draft as follows, to wit: when closed, the circuit-draft is in operation (when the said vertical inner tube, L, and said outer tube, M, are omitted and not used upon such stove, which may be the case) from said radiating-chamber B into the said horizontal flue *g*, down and through each of the said radiating tubes or columns G, into the upper flue, *e*, in the said base, thence forward over the front edge of the said division-plate I, Fig. 4, thence along the bottom of the stove through the said lower flue, *f*, and then into the lower end of the said exit-pipe H, Figs. 2 and 3, and up the same into the chimney through the pipe leading thereto. But when the said inner tube or cylinder, L, and the said outer tube or casing, M, are used, arranged, and combined substantially as seen at Fig. 4, then the circuitous draft will be in the line and direction as shown or indicated by the red arrows at Fig. 4. It will be now seen that by means of the said vertical inner and outer tubes or cylinders, L and M, I obtain a greater amount of radiating-surface than would be the case were said tubes or cylinders omitted and not used with said stove. By means of the said inner and outer tubes or cylinders, L and M, the escaping heat is temporarily confined or checked within the said inner tube, L, and within the said radiating-chamber B′, and thereby somewhat aids or facilitates the combustion of the gases and smoke at and within the aforesaid conical-shaped perforated tube or device E, while at the same time the radiating-surface of the stove is much extended or enlarged, as aforesaid. The said outer vertical tube, M, is capped or covered over entirely at the upper end thereof, by means of which the heat is directed downward in its circuit in the manner indicated by the red arrows at Fig. 4, and may have parallel sides or be made in tapering form, like the said inner vertical tube, L.

P, Figs. 1 and 8, is the front door, through which the fire chamber B is supplied with fuel or coal, and which, of course, passes into the said throat E′, Fig. 8, and down through the inner part of the said perforated tube or gas-burning device E. The said door I construct of any desired size or shape, and with one or more wire-gauze panels, hereinafter set forth. Upon the inner or outer side of the same I place, in any good and convenient manner, the wire-gauze *a a*, Fig. 8, and also shown at Fig. 1. Through this wire-gauze cold atmospheric air passes and enters the said radiating-chamber B′, and comes in contact with the flame of fire in the said throat E′, made by the combustion of the gases and smoke evolved from the fire in the said fire-chamber B, and the same passing upward and into the said perforated tube or device, and then coming in contact with the atmospheric air which enters the same through and by means of the said perforations, in the manner herein described and set forth. The atmospheric air which thus passes through said wire-gauze and in contact with such flame of fire somewhat aids in the more perfect combustion of such gases and smoke, which, of course, are highly heated by means of the fire in the fire-chamber B, and in that state or condition coming in contact with the atmospheric air entering the said tube or device E, in the manner substantially as aforesaid, ignition takes place and a flame of fire is produced within the chamber or space formed by means of the said tube or device, and within the said throat E′. There is therefore a draft through the said wire-gauze in said door P. There is also a draft through the said perforations in the said tube or device E. There is also a draft through the fire-grate K, and through the fire in the fire-chamber B, by means of the usual valve or damper opening into the ash-chamber below the fire-grate, and seen at Fig. 1.

The said return-flues *e* and *f* are cleaned by means of the openings in the rear of the stove, as shown at Fig. 2, after which these openings are closed up by any suitable means. The

back part of the said perforated tube or cone E may be provided with flanges *i i*, Figs. 4, 5, and 6. These flanges draw the heat from the said cone or tube, and thereby preserve the same from undue action of the heat, and thereby serve to keep said tube or cone as cool as possible and in a more durable condition. The said perforated tube or cone E may be constructed in one piece, if deemed best so to do, in which case it would be necessary to drill for the said apertures in order to make them. However, I prefer to make it in sections or parts, as hereinbefore described and set forth, as it will endure the heat much longer, and of course not burn out as soon.

It is manifest that my said invention and improvements herein specified may also be successfully applied to the fire-pots or fire-chambers of any stove, heating-furnace, locomotive or fire engines, &c., for the purpose of generating heat and economizing in the use of bituminous coal or other soft or similar coal, as well as to successfully use or burn the same for the purposes aforesaid.

Having thus described the construction and operation of my said invention and improvements in bituminous-coal stoves or burners, what I claim, and desire to secure by Letters Patent of the United States of America, is—

1. The employment of the perforated cone or cap E, constructed, arranged, and combined with the said plates C and D, and with the fire-pot or combustion-chamber of a stove, in the manner and for the purposes substantially as herein described and set forth.

2. The employment of the wire-gauze door P or its equivalent, in combination with the said perforated cone or cap E, or any equivalent therefor, and with the said radiating-chamber B′, in the manner and for the purposes substantially as herein described and set forth.

3. The perforated cone or cap E, constructed and arranged in sections *a b c*, with small apertures between each section or division, in the manner and for the purposes substantially as as herein described and set forth.

4. The arrangement and employment of the inner vertical tube or conical cylinder, L, and the outer vertical tube or cylinder, M, in combination with the radiating-chamber B′, and with the horizontal flue *g g*, in the manner and for the purposes substantially as herein described and set forth.

5. The arrangement and combination of the vertical radiating tubes or columns G G G G with the return-flues *e* and *f*, in the manner and for the purposes substantially as herein described and set forth.

6. The said flanges *i*, constructed and arranged upon the outside of the said perforated cone or cap E, in the manner and for the purpose substantially as herein described and set forth.

7. The combination of the said perforated cap or cone E or its equivalent with the air-chamber surrounding the chamber of combustion and communicating with numerous apertures, and the said wire-gauze door P, in the manner and for the purposes substantially as herein described and set forth.

In testimony whereof I have hereunto set my hand this 24th day of May, A. D. 1865.

P. P. STEWART.

Witnesses:

CHARLES D. KELLUM,

R. H. REILLE.