3 Sheets—Sheet 1.

SHIELDS & PIERCE.

Heating Stove.

No. 7,891.

Patented Jan'y 7, 1851.

Fig. 1

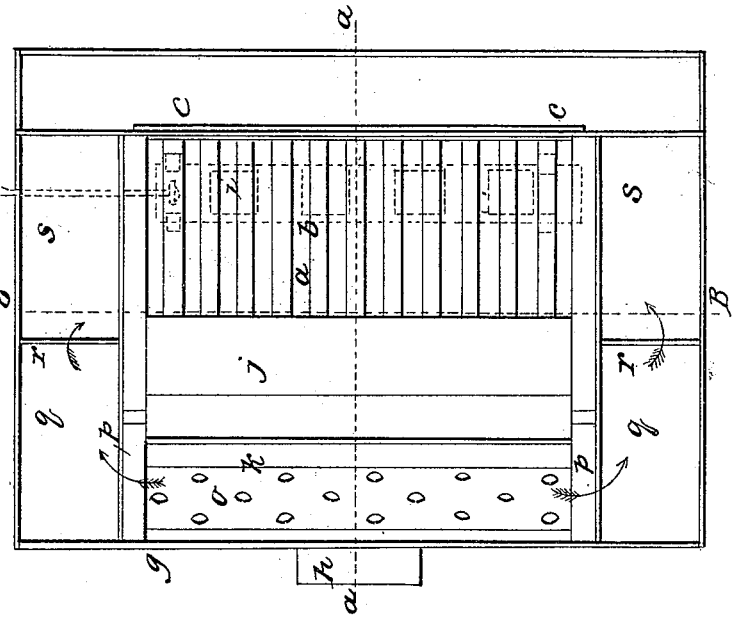

Fig. 4

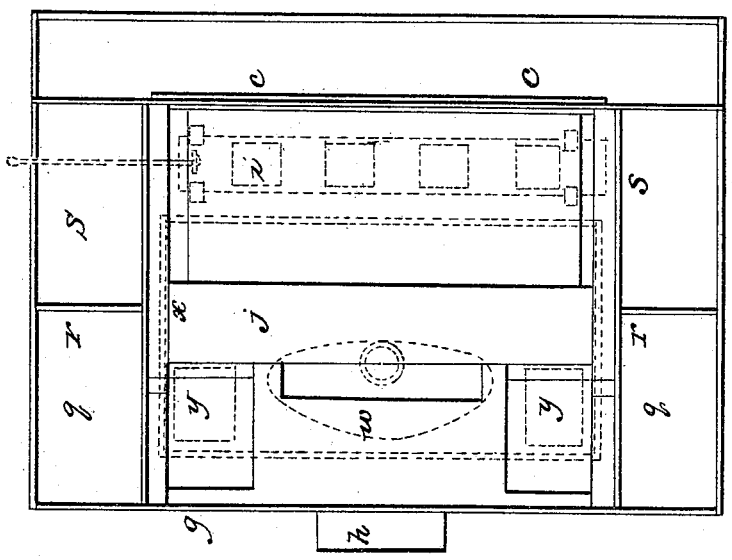

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Fig. 3. B b

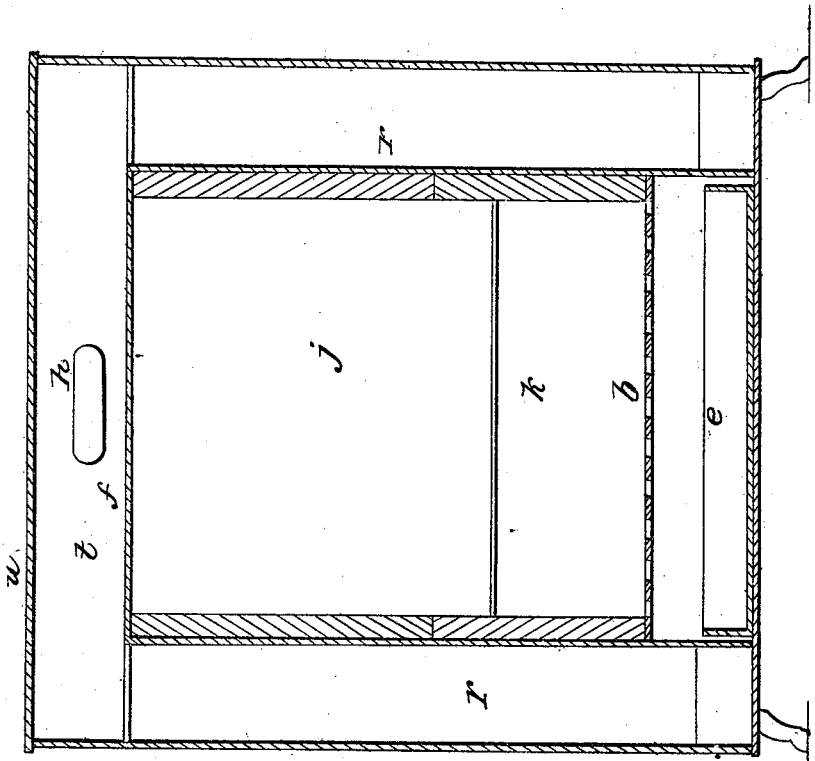
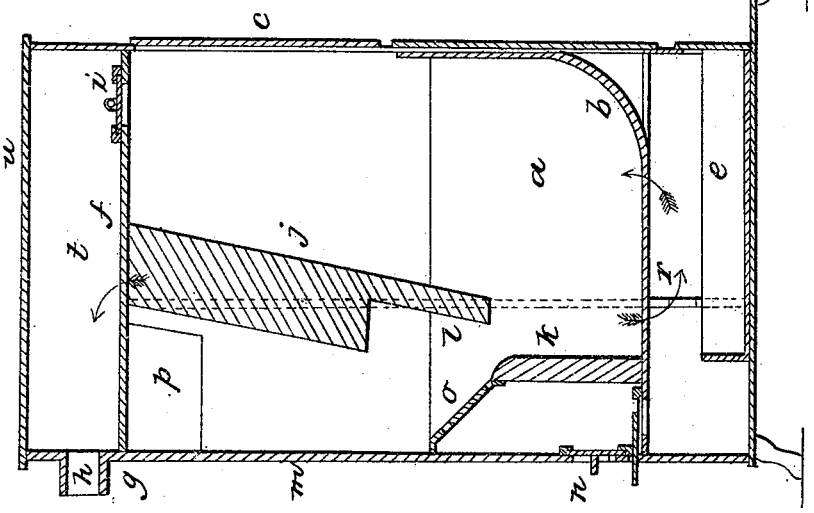


Fig. 2. A a



3 Sheets—Sheet 3.

SHIELDS & PIERCE.

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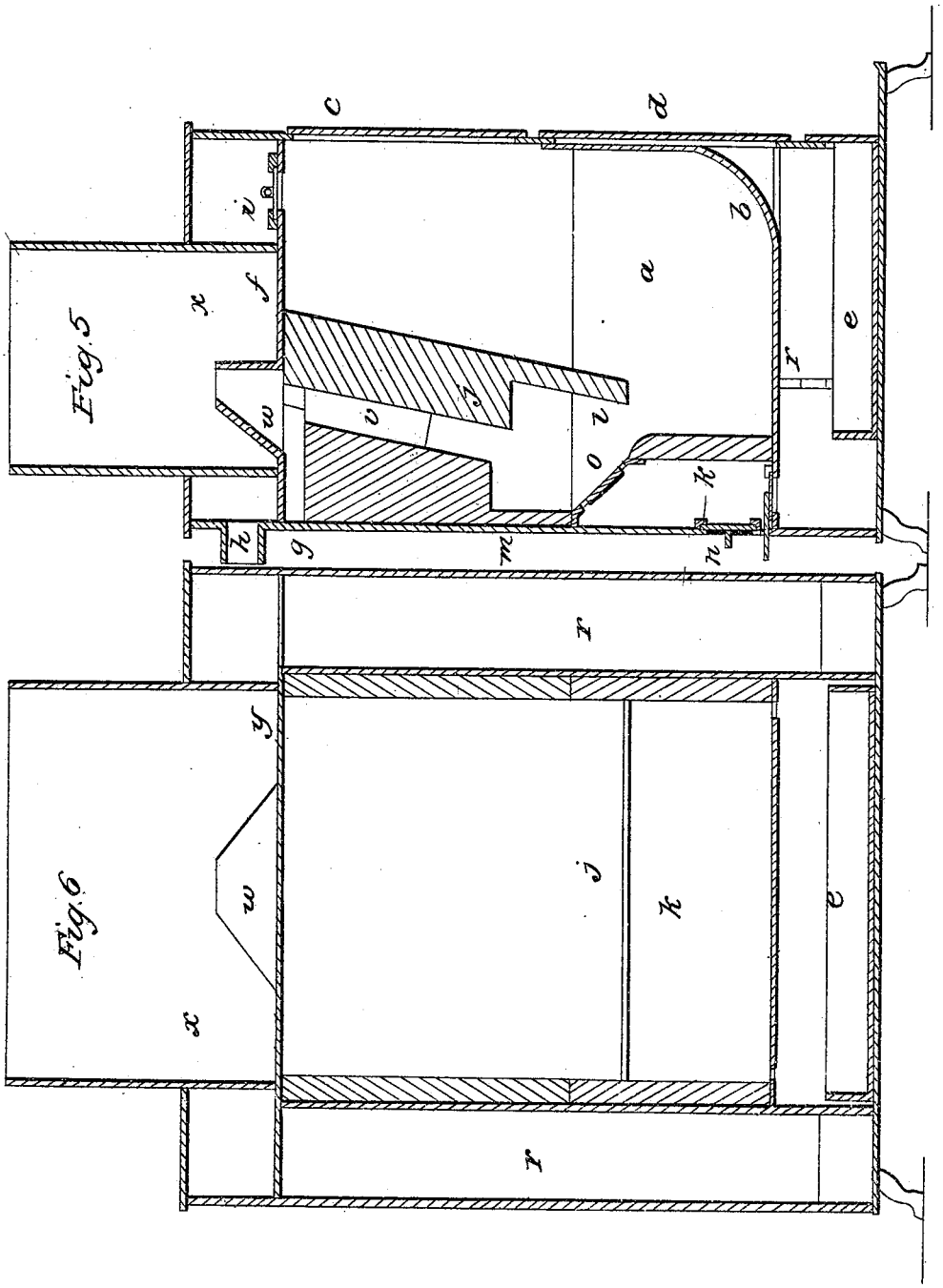

UNITED STATES PATENT OFFICE.

JAMES SHIELDS, OF NEW YORK, AND SAML. PIERCE, OF TROY, NEW YORK.

COAL-STOVE.

Specification of Letters Patent No. 7,891, dated January 7, 1851.

To all whom it may concern:

Be it known that we, JAMES SHIELDS, of the city, county, and State of New York, and SAMUEL PIERCE, of Troy, in the county of Rensselaer and State of New York, have invented a new and useful Improvement in Stoves for Burning Anthracite and Bituminous Coal, and that the following is a full, clear, and exact description of the principle or character which distinguishes my invention from all other things before known and of the method of making, constructing, and using the same, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1, is a plan of our improved stove for burning anthracite coal with the top removed, and Figs. 2 and 3, vertical sections of the same taken at the lines A, *a*, and B, *b*, of Fig. 1, and Figs. 4, 5 and 6 are like views and sections of a stove on the same principle adapted to the burning of bituminous coal.

The same letters indicate like parts in all the figures.

Our invention is of an improvement on the downward draft stove invented by Dr. Eliphalet Nott, in which the charge of coal is contained in a fire chamber extending above the aperture for the draft leading to the flues through which the products of combustion circulate, to heat a large amount of metal surface for the radiation of heat.

We have ascertained by careful investigation that the gaseous products of combustion in this stove are inflammable when anthracite coal (the only fuel heretofore used in this kind of stove) is burned; the proportion of inflammable gases being greatly increased when bituminous coal is substituted. These inflammable gases escaping unconsumed, give out, comparatively, but little heat, and from this circumstance a stove which in other particulars presents unquestionable advantages over others has been in a great measure superseded. In other stoves, or such as have what is called the upward draft the whole charge of coal soon reaches the incandescent state, the draft being carried directly through the whole charge, from which it follows as a necessary consequence either that such a stove will give out too much heat with a corresponding consumption of fuel, or the charge of coal will be too small, requiring the charge to be frequently renewed, which is attended with much annoyance and labor and with a great waste of fuel, as it is well known that coal, particularly anthracite, burns better and with greater economy in large masses. But in Nott's downward draft stove, the heated draft, that is, the gases evolved from the coals in an incandescent state, do not pass through the whole charge but pass directly through that portion of the charge which is below the throat or draft aperture, the other portion of the charge above the throat simply undergoing a distilling or preparatory process; and therefore all that part of the fire-chamber above the throat may be called a chamber of preparation.

To effectually consume the inflammable gases evolved by an imperfect combustion, such as usually takes place in stoves, these gases should be in a highly-heated state when they meet and mingle with the supporter of combustion, and the higher the temperature, the more perfect will be the combustion; but in all the upward draft stoves, the gases evolved by the incandescent coals in passing up through the upper part of the charge, necessarily lose a great portion of their heat, and become too much cooled to be inflamed advantageously; and in the commencement of the burning of a charge the distilling process is carried on with great rapidity, giving out a greater quantity of inflammable gases than can be consumed, and in a short time the whole charge becomes incandescent, and then the quantity of inflammable gases given out is too small to need to be consumed. Hence, in such stoves, if means be employed for consuming the inflammable gases, at first such means will be insufficient, and in a short time comparatively useless, and, what is more objectionable, in the commencement of a charge the inflammable gases given out by the incandescent coals, become so much cooled that they can only be consumed by means of highly-heated atmospheric air; and from this it follows that after the whole

charge becomes incandescent, and the quantity of inflammable gases given out is very small, the means employed for heating the supply of atmospheric air becomes a waste. But in the downward draft stove, such as we have above indicated, the upper part of the charge in the chamber of preparation is all the time exposed to nearly the same heat from the incandescent coals below the draft throat and the inflammable gases given out with a nearly regular supply must pass through a portion of the incandescent coals to reach the draft throat, and in so doing they become highly heated and thus reach a state in which they can be inflamed by admixture even with cold atmospheric air.

With these preliminary remarks we declare that the principle or character of our invention which distinguishes it from all other things before known, consists in combining with a fire chamber, having the draft throat leading to the flue or flues, below the top of the charge of coal, the necessary means for supplying a current or currents of atmospheric air at or near the said throat, for the purpose of inflaming the combustible gases given out by the charge of coal, by means of which combination we are enabled effectually to inflame the combustible gases evolved, while at the same time we are enabled to put a heavy charge of coal in the stove, and to give out the combustible gases more regularly and at a higher temperature than in any other stove known to us.

In the accompanying drawings (*a*) represents the fire chamber with a grate (*b*). The front of the fire chamber is provided with two sets of doors (*c*, *c*) and (*d*, *d*), the set (*c*, *c*) above the grate, and the other (*d*, *d*) in front of the grate. Below the grate there is the usual sliding ash pan (*e*) which, when closed, excludes air. The top of the fire-chamber is covered with a plate (*f*) which extends to the back-plate (*g*); and over the fire chamber this plate is provided with draft holes leading to the exit pipe (*h*) which holes are governed by a sliding damper (*i*) so that when this sliding damper and ash pan are opened, there is a direct draft as in ordinary stoves for starting the fire; but after this the damper must be closed as also the ash pan. The fire-back, or back of the fire chamber, which should be made of fire brick or some other refractory substance, is in two parts (*j*, *k*), the upper part (*j*) extending down from the top plate to some distance below the top of the grate, that a portion of the charge of coal may be above its lower edge, and the other part (*k*) at some distance back of it leaving a throat (*l*) between the two, through which the products of combustion pass to the main flue or chamber of inflammation between the part (*j*) of the fire-back and the stove-back (*m*). And the space between the lower part (*k*) of the fire-back and the stove-back constitutes a chamber into which atmospheric air is admitted from the room through apertures governed by a damper or dampers (*n*). The top of this air chamber is covered by an inclined plate (*o*) perforated with small holes through which atmospheric air passes in small jets to mingle with and inflame the highly heated combustible gases as they pass from the fire chamber through the throat to the chamber of inflammation. The top of this chamber of inflammation being covered, the products of this final combustion pass out through lateral apertures (*p*, *p*) into descending flues (*q*, *q*) at the sides; thence, under the lower edge of two vertical partitions (*r*, *r*,) up two side vertical flues (*s*, *s*,) in front of the flues (*q*, *q*,) and then to the space (*t*) between the top-plate of the fire-chamber and the top (*u*) to the exit pipe (*h*).

After the fire has been kindled the draft is admitted through the front upper doors, and, unless a very rapid combustion be required, the air that passes through the imperfect joints of the doors will be sufficient. The draft passes through the charge of coal above carrying the inflammable gases down to, and through a portion of the incandescent coals to the throat, through which they pass with the gases evolved from the combustion of the incandescent coals, the gases thus becoming so highly heated as to inflame the moment they meet with the jets of atmospheric air from the air chamber, and thus produce a great body of flame in the chamber of inflammation, which thence passes through the flues, heating to a high temperature all the parts of the stove through which the flues pass.

When our improved stove is applied to the burning of bituminous coal, we prefer to leave the grate closed at the bottom as represented in Fig. 4, and the chamber of inflammation narrowed toward the top, as at (*v*) to make a second throat on the principle secured by Letters Patent granted to James Shields and James Cole, bearing date the 10th day of March A. D. 1849. On this second throat we place an inverted funnel (*w*) through which the products of combustion pass into a drum (*x*) in which the products of combustion circulate, and then pass out through apertures (*y*, *y*,) in the bottom of the said drum or top-plate of the fire chamber, and thence through the flues to the exit-pipe in the same manner as in the stove for burning anthracite coal above described.

We have described such arrangements of flues &c. as we have essayed with success in the application of the principle of our in-

vention, but we do not wish to limit ourselves to these, as they may be variously modified. But

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

The method substantially as herein described of supplying currents of atmospheric air to the products of the combustion at or near the throat leading from the fire-chamber to the flues, in combination with what is known as Nott's fire-chamber, having the draft throat leading therefrom between the top and the grate that the upper part of the fire pot may constitute a feeder or chamber of preparation, substantially in the manner and for the purpose specified.

JAMES SHIELDS.
SAMUEL PIERCE.

Witnesses as to signature of James Shields:

ALEX PORTER BROWN,
CAESAR BROWNE.

Witnesses as to signature of Samuel Pierce:

WM. BISHOP,
CAESAR BROWNE.