I. G. MACFARLANE.

Heating-Stoves.

No. 145,744. Patented Dec. 23, 1873.

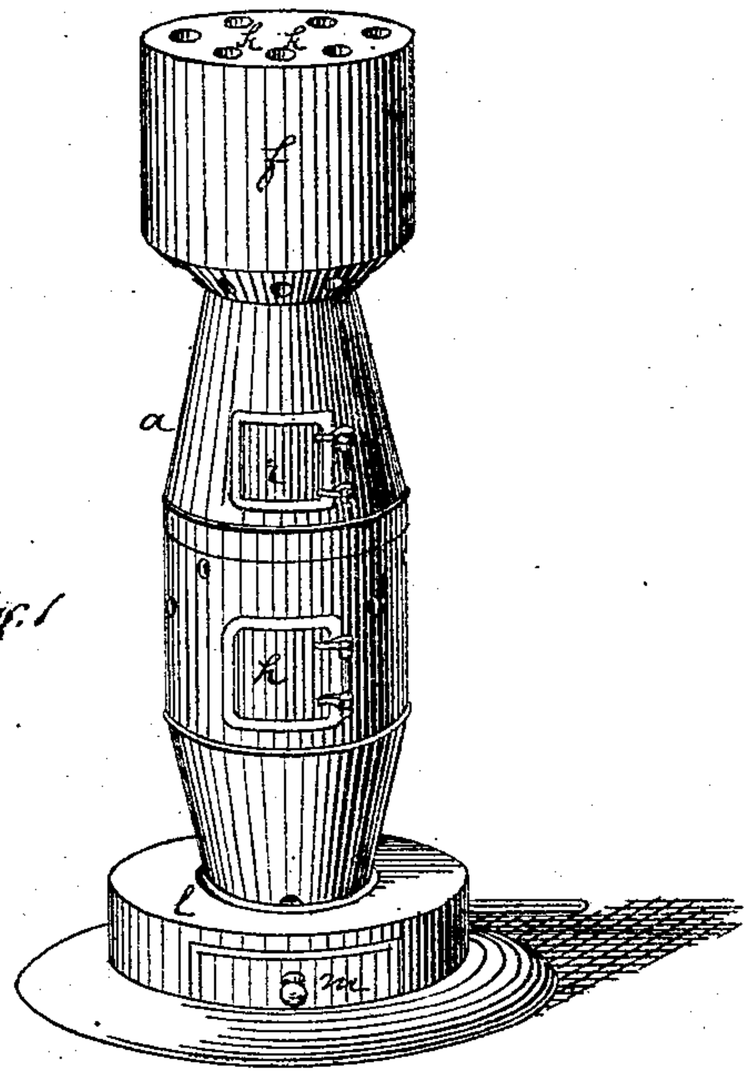

Fig. 1

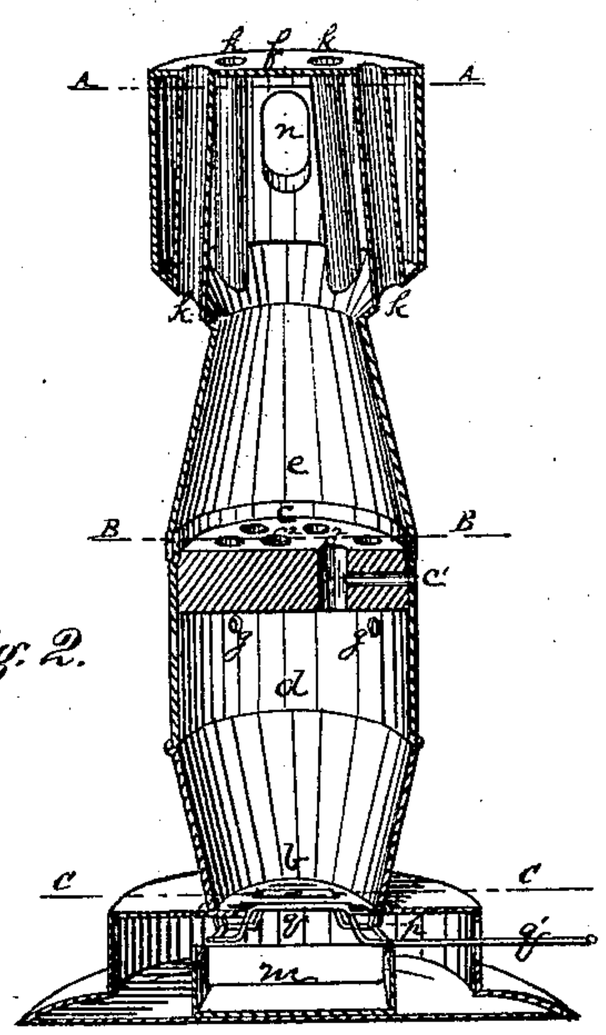

Fig. 2.

Fig. 6

Fig. 3.

Fig. 5

Fig. 4

Witnesses { James L. Kay, Fred Standish

Inventor Isaiah G. Macfarlane, by Baxewell Chisholm & Chisholm his attorneys

UNITED STATES PATENT OFFICE.

ISAIAH G. MACFARLANE, OF PITTSBURG, PENNSYLVANIA.

IMPROVEMENT IN HEATING-STOVES.

Specification forming part of Letters Patent No. **145,744**, dated December 23, 1873; application filed September 23, 1873.

To all whom it may concern:

Be it known that I, ISAIAH G. MACFARLANE, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Stoves; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawing, forming a part of this specification, in which—

Figure 1 is a perspective view of my improved stove. Fig. 2 is a vertical section. Figs. 3, 4, and 5 are, respectively, sections through A A, B B, and C C, Fig. 2; and Fig. 6 is a vertical section of the base.

My improvement is designed to effect the combustion of smoke and gases, which escape unconsumed from the fire-chamber of stoves in which bituminous coal and other fuel rich in carbon are used. In the stove to which I have applied my improvements there are two grates, arranged, one over the other, in such a manner that the draft from the lower one shall be directly through the upper one, and so near each other that the heat radiated down from the upper grate shall operate upon and aid in the combustion of the fuel in the lower one. In this stove bituminous coal and other fuel rich in carbon and hydrogen are used on the lower grate, and on the upper grate anthracite coal, coke, or other fuels which contain little, if any, volatile combustible matter.

My improvement consists, first, in the construction of the upper grate, which is made of fire-clay or other like material, with suitable flues for supplying the requisite amount of oxygen to the center of the ascending current of combustible gases from the lower fire. It also consists of a series of openings for admitting oxygen into the lower chamber of the stove, just below the upper grate, such oxygen mingling with the other portion of the ascending current, to supply sufficient oxygen at that point.

To enable others skilled in the art to make and use my improvement, I will describe its construction and manner of use.

The stove *a* is of the usual cylindrical shape, and is provided with a grate, *b*, of the ordinary construction, at or near the base. At or near the middle of the stove is a second grate, *c*, which is made of fire-clay or other like infusible material. This grate has a series of flues, c^1, leading in from the outer casing to the center openings c^2, for the purpose of supplying air at that point. Opening into the chamber *d* are a number of ports, *g*, which admit air around the sides of the stove. The chamber *d* is fitted with a door, *h*, by means of which fuel is supplied, &c., and the chamber *e* has a similar door, *i*. At the top of the stove is a heat-radiating drum, *f*, which projects over the sides of the stove into the path of the current of air, which, heated by the hot sides of the stove, ascends around it. In this projecting edge I make a series of vertical flues, *k*, through which the ascending heated air passes. The heat on the inside of the stove circulates around these tubes, so as to heat them very highly, such heat being transmitted through them and given off into the ascending currents of air. Attached to the drum is a smoke-pipe, *n*. The base *l* is fitted with an ash-pan, *m*, in the usual way. Hung to the links *p* is a vibrating stirrer, *q*, the bars of which stand across the wide portions of the openings *r*. The distance between the bars of the stirrer and the sides of the wider portions of the openings *r*, is equal to the distance between the bars of an ordinary grate. The ends *r'* of the openings *r* which are beyond the ends of the bars of the stirrer, are narrower, so as to be about equal to the space between the bars of an ordinary grate. When it is desired to stir the fire in the grate *b*, the stirrer *q* is moved, by means of the handle *q'*, backward and forward, thereby communicating to it an oscillating movement upon the links *p*. In this movement the bars of the stirrers swing into and from the narrow ends of the openings *r*, rising at the ends and falling in the center. This movement is similar to the movement of a poker in a grate of the ordinary construction.

The operation of this stove is as follows: The fire is first made in the upper grate *c*, of coke or other like fuel, and when the draft is fully established a fire of bituminous coal is made upon the lower grate *b*. Then the ascending smoke and gases from the lower grate are drawn through the upper fire and there consumed. The oxygen necessary to the consumption of these gases is supplied, first,

through the openings *g*, around the edges of the ascending current, and, second, through the flues c^1 and center openings c^2, to the center of the ascending current. Some of the gases which are generated in the lower chamber are not consumed by being simply passed through a fire of incandescent coals, like the fire in the grate *c*, but are changed in form—that is, are rendered invisible. This fact has often given rise to the erroneous impression that these gases are consumed, thus explaining the reason of the failure of many smoke-consuming apparatus. If, however, sufficient oxygen is supplied under suitable conditions—that is, in the presence of intense heat—these gases are combined therewith and consumed. Some combine with the oxygen of the air, so as to be consumed, in the ratio of eighteen parts, by weight, of air to one part of gas. In order that the oxygen may be intimately intermixed with these gases, I have made two sets of air-flues, *g* and c^1, so as to reach all portions of the ascending gaseous current. The fire on the upper grate not only consumes the gases from below, but, becoming intensely heated on account of the extremely combustible nature of the gaseous fuel, radiates heat down upon the lower fire, so as to aid in the combustion of the fuel thereon. This causes a very rapid generation of the gases from the lower fire. After the fire on the upper grate has once been kindled, it does not require to be renewed more than once or twice a day, because the volatile fuel from the lower fire, supplying food for combustion, causes it to operate much in the same way as the wick in a candle. By this arrangement I am enabled to use very inferior fuel in the lower grate. The fire in the lower grate is designed not only for heating purposes, but also for generating volatile fuel for the upper grate. The upper grate-fire requires, as beforesaid, but little attention, and consequently but little labor in removing ashes, &c., thus rendering the stove, with the exception of the work at the time of kindling the fire therein, of no more additional trouble than an ordinary stove.

The advantage of this stove, in addition to its utility in affording a convenient and easy method of utilizing and saving fuel, by the consumption of the smoke and gases, is its great heating power. The reason I form the grate *c* of an infusible indestructible material is because of its exposure to the heat of the two fires. If made of metal it would be burned out in a short time. The ports *g* and flues c^1 may be fitted with dampers, consisting of flat metallic rings extending around the stove, susceptible of a slight movement, and having openings to register with the ports and flues.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The grate *c*, constructed of fire-clay or other infusible material, having flues c^1 extending to the center openings c^2, substantially as and for the purposes described.

2. The grate *c*, having flues c^1, in combination with the fire-chamber *d*, having ports *g*, and a grate, *b*, substantially as described.

In testimony whereof I, the said ISAIAH G. MACFARLANE, have hereunto set my hand.

ISAIAH G. MACFARLANE.

Witnesses:
T. B. KERR,
JAMES I. KAY.