2 Sheets—Sheet 1.

A. FRYER.

Kiln for Carbonizing Street-Refuse.

No. 213,409. **Patented Mar. 18, 1879.**

Fig. 1.

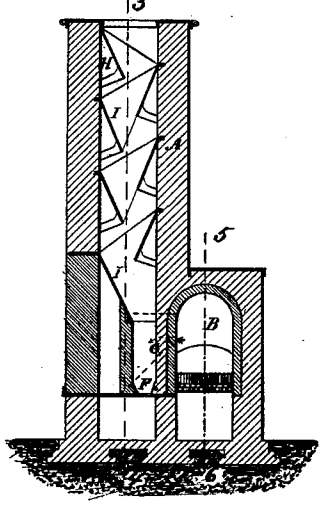


Fig. 2.

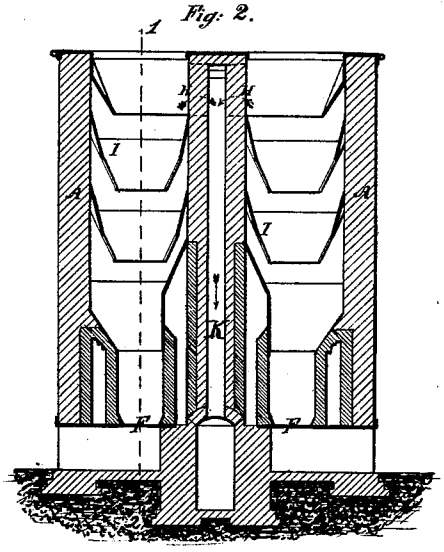
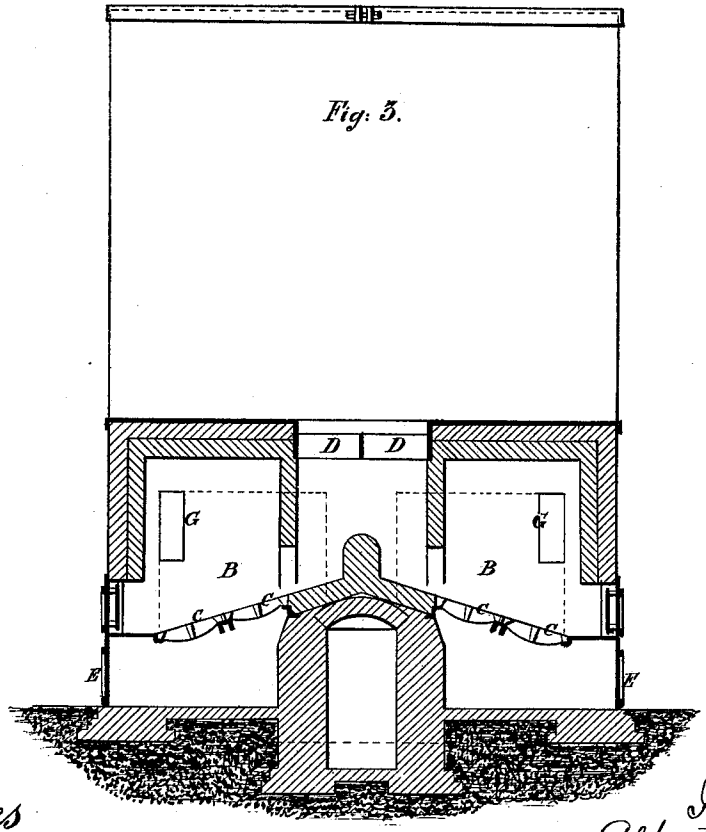


Fig. 3.



Witnesses
Henry Howson Jr.
Harry Smith

Inventor
Alfred Fryer
by his Attorneys
Howson and Son

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

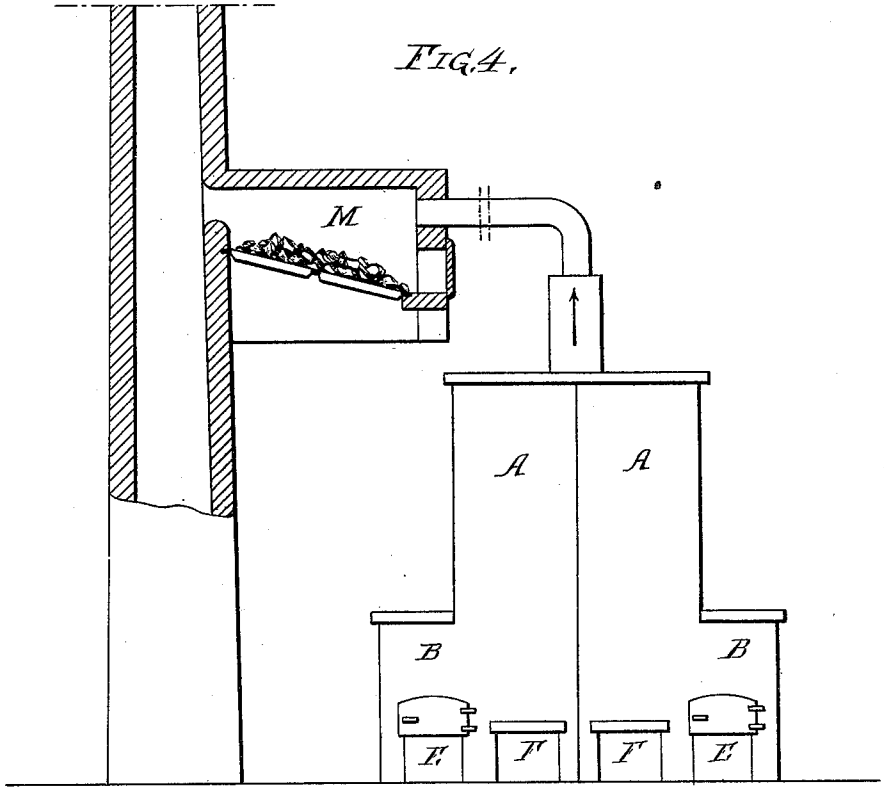
2 Sheets—Sheet 2.

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FIG. 4.



Witnesses
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Harry A. Crawford

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UNITED STATES PATENT OFFICE.

ALFRED FRYER, OF WILMSLOW, GREAT BRITAIN.

IMPROVEMENT IN KILNS FOR CARBONIZING STREET-REFUSE.

Specification forming part of Letters Patent No. **213,409**, dated March 18, 1879; application filed February 11, 1878; patented in England, February 11, 1876.

To all whom it may concern:

Be it known that I, ALFRED FRYER, of Wilmslow, in the county of Chester, Kingdom of Great Britain and Ireland, have invented certain Improvements in Apparatus for Treating Street-Sweepings and other Refuse, of which the following is a specification:

My improved apparatus, for which an English Patent, No. 550 of 1876, has been granted to me, consists of an improved form of kiln for carbonizing street-sweepings or other refuse matter. The kilns at present in use for carbonizing purposes are either quite unsuited to admit the heterogeneous mass of which these are composed, by reason of the smallness of their carbonizing-chambers, (a condition essential to their success in carbonizing cheaply,) or they have costly moving parts, liable to rapid deterioration from accidental stoppage of the machinery, and from the fact that all the heat used is transmitted through their inclosing-surfaces, while few, if any, apply the heat directly to the materials to be carbonized.

In the annexed drawings, Figure 1 is a longitudinal section taken vertically through the line 1 2, Fig. 2 a vertical section through the line 3 4, and Fig. 3 a vertical section through the line 5 6, of my improved kiln as arranged for carbonizing street-sweepings or other refuse matter; and Fig. 4, Sheet 2, a view, partly in section, showing a modified arrangement of the double kiln, with a furnace for consuming the gases from the carbonizing-kilns.

My improved kiln A A is heated by means of a furnace or furnaces B B, which I prefer to place at its side, and to provide with fire-bars C C, suitable for burning cinders, sloping sharply from the back toward the door, (see Fig. 3,) while at the back and above the furnace I place a hopper, D, for the supply of fuel. In order to enable this furnace more readily to consume such refuse fuel, I prefer to make use of an ordinary chimney-draft, taking care, however, to regulate the supply of air; but in some cases I fit it with close ash-pit doors E, while I force air into the ash-pit, and thence through the fuel, by means of a fan or other suitable apparatus. This arrangement permits me to regulate the quantity of air passing through the furnaces B B, and I so regulate the air in relation to the thickness of the mass of incandescent fuel that the oxygen supplied is (as far as practicable) consumed in the furnace, and I prefer that it should be insufficient to burn the carbon in the fuel wholly into carbonic acid.

The gaseous products of combustion thus formed, which contain little free oxygen, I then lead into the kiln A itself. This I prefer to make rectangular in horizontal section, but larger above, where the street-sweepings enter it, damp and bulky, than at the bottom, where they leave it, dry and carbonized.

The top may, if desired, be closed by a removable cover. The bottom is closed by a slide at F, which, when withdrawn, permits the contents of the kiln to drop through it by their own weight. The gaseous products of combustion from the furnaces enter the kilns A at the side, near the bottom, through the passages G, and, after passing through the kilns, escape, preferably, through openings H into and down a flue, K, arranged between the two kilns, and communicating with the chimney.

It is obvious that if the kiln A were quite full of street-sweepings or other matter to be carbonized it would be difficult for the gaseous products of combustion to force their way through. To overcome this difficulty, I arrange a series of inclined shelves or inverted gutter, I I, (which I prefer to make of metal,) spirally around the interior walls of the kiln, in such a way as to lead from the point at which the products of combustion enter to that at which they leave the kiln. This spiral shelving or inverted gutter, passing around the interior of the kiln, forms a sort of ledge, which throws the sweepings or other materials in the kiln from side to side as they pass downward, to a considerable extent holds them up, and prevents them from becoming compacted into a solid mass, and also tends to turn them over, so as to expose fresh surfaces to the heated gases or the heated side of the gutter.

As the lower side of the inverted gutter I is open, the heated gases are free to come into direct contact with the sweepings or other material to be carbonized, while, as all the available oxygen has already been utilized, they can only drive off the water and distill off the hydrogen compounds, and cannot carry off the

carbon. Thus they effect the carbonization partly by coming into direct contact with the material to be carbonized, and partly by heating the sides of the inclined shelves or inverted gutter I, with which that material is in contact.

The gases passing out of the kiln consist to a large extent of carbonic oxide and of hydrogen compounds, and I sometimes mix these with a further supply of air and pass them through another furnace, M, Fig. 4, interposed between the kiln or kilns and the chimney, so that they may be burned and made to yield an additional supply of heat, while at the same time any odor which may have been present in them is destroyed. The heat generated by this second furnace I employ to generate a supply of steam for evaporating or concentrating urine, or for any other purpose.

The carbonized street-sweepings form on leaving the kiln a kind of charcoal, which is used in a manner well known for mixing with sewage, and more especially where the feces and urine are collected separate from other refuse matter for mixing with these, in order to deodorize them and prevent them from fermenting and becoming offensive, and when thus treated these matters have a considerable manurial value.

Sometimes I use the heat of the second furnace for heating urine and fecal matter in a closed vessel to such a temperature as shall decompose the urea and other nitrogenous compounds. Decomposition having thus been effected, the valuable matter, in the shape of ammonia, can more readily be separated from the other ingredients by distillation or other convenient means; but this forms no part of my present invention.

I claim as my invention—

1. The combination of a heating furnace or furnaces with two kilns, A A, outlets H H, and flue K, arranged between said kilns and communicating with the chimney, all substantially as set forth.

2. In a charring-kiln, the inclined shelving I, arranged spirally within the kiln, as and for the purpose set forth.

3. The combination of a heating furnace or furnaces, B, having a passage, G, with a carbonizing-kiln, A, provided with the inclined shelving I, arranged spirally within the kiln, as described.

4. The combination of a carbonizing-kiln, A, and a chimney, with a furnace, M, the combustion-chamber of which forms the communication between the outlet of the said kiln and the chimney, substantially as described.

In testimony whereof I have set my hand to this specification in presence of two subscribing witnesses.

ALFRED FRYER.

Witnesses:
GEORGE DAVIES,
JOHN HUGHES.