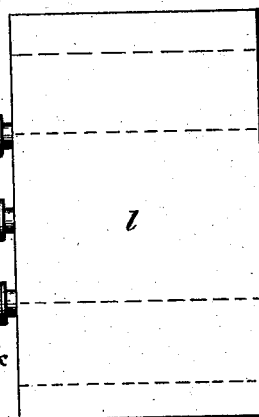
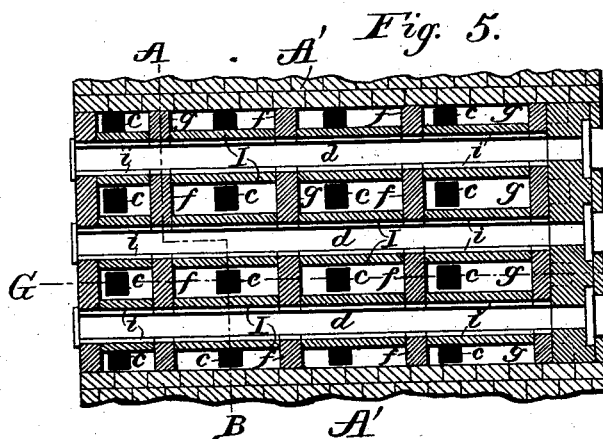
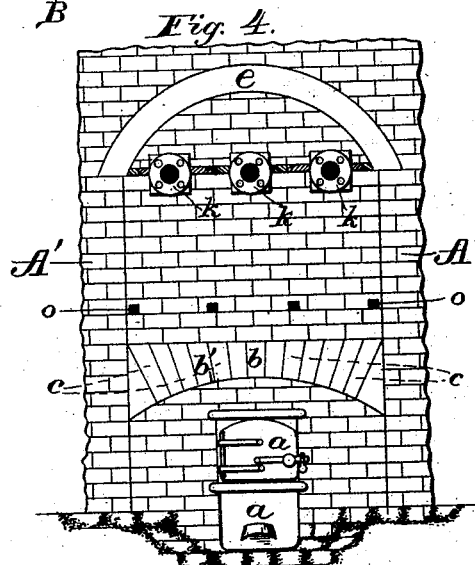
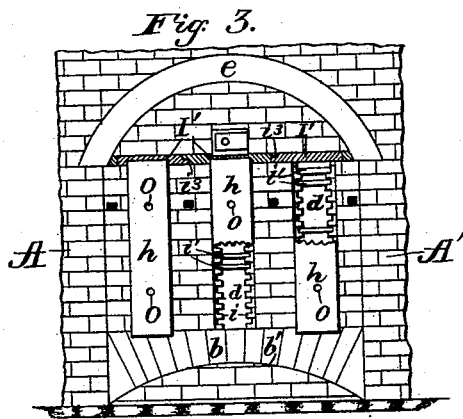
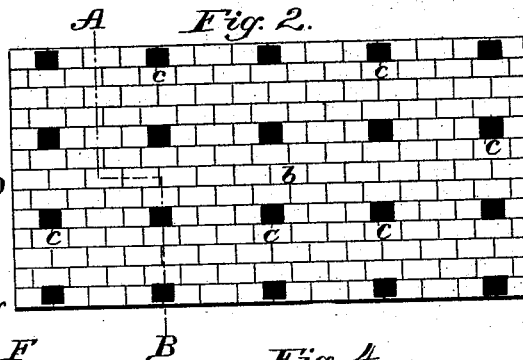
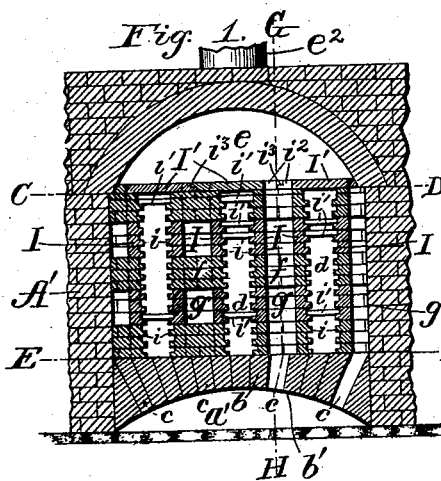


A. CROSSLEY & J. W. JONES.

APPARATUS FOR PRODUCING FERROFERRIC AND FERRIC OXIDES.

No. 491,085.

Patented Feb. 7, 1893.



Witnesses;

Percy C. Bowen
J. L. Wilson

Inventors

Atkinson Crossley +
James W. Jones

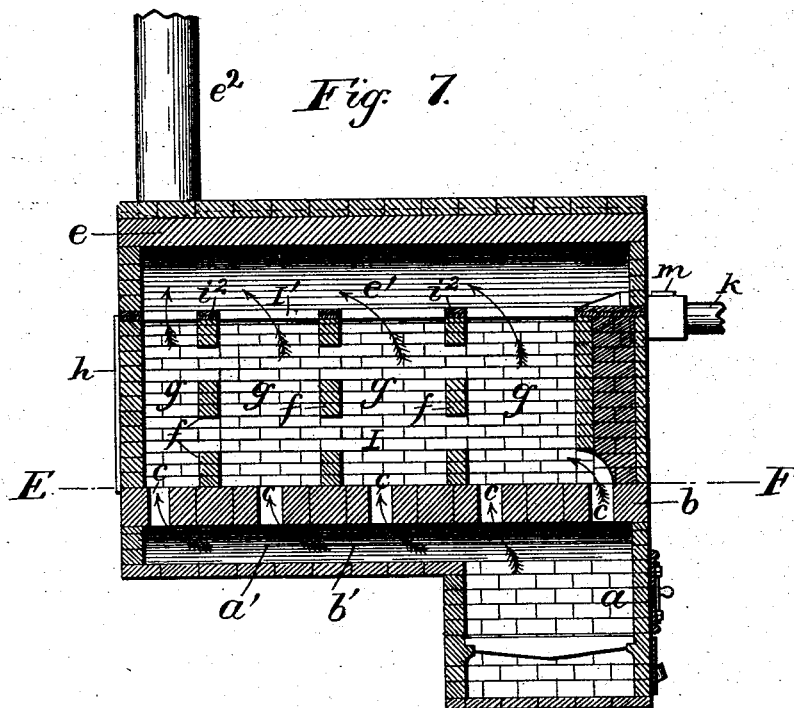
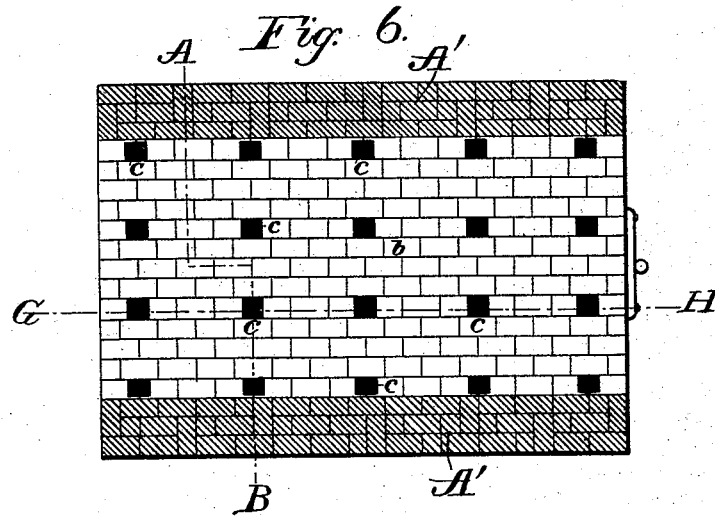
By Whitman + Wilkinson
Attorneys.

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Witnesses

Ray C. Brown
John Q. Wilson

Inventors

Atkinson Crossley, &
James W. Jones
 By *Whitman & Wilkinson*
 Attorneys

UNITED STATES PATENT OFFICE.

ATKINSON CROSSLEY, OF PONTYPOOL, AND JAMES WILLIAM JONES, OF
WHALLEY RANGE, ENGLAND.

APPARATUS FOR PRODUCING FERROFERRIC AND FERRIC OXIDES.

SPECIFICATION forming part of Letters Patent No. 491,085, dated February 7, 1893.

Application filed November 18, 1891. Serial No. 412,336. (No model.) Patented in England June 9, 1890, No. 8,914.

To all whom it may concern:

Be it known that we, ATKINSON CROSSLEY, of Pontypool, in the county of Monmouth, and JAMES WILLIAM JONES, of Whalley Range, Manchester, England, subjects of the Queen of Great Britain, have invented new and useful Improvements in Apparatus for Producing Ferroferric and Ferric Oxides, (for which we have obtained a patent in Great Britain, No. 8,914, bearing date June 9, 1890,) of which the following is a specification.

Our invention relates to improvements in apparatus for producing ferroferric and ferric oxides ordinarily used in the manufacture of paints and colors, and it has for its object to obtain greater cheapness, durability, and efficiency in the apparatus employed and a more economical and effective result than has heretofore been the case. We attain these results by the improved furnace illustrated in the accompanying drawings in which,—

Figure 1 is a transverse section through the line A, B, (Figs. 2, 5 and 6.) Fig. 2 is a plan of the floor of the retort, Fig. 3 is a view of the charging end of the retorts, Fig. 4 is a view of the firing end, and Fig. 5 is a horizontal section on the line C, D, of (Fig. 1). Fig. 6 is a horizontal section on the line E F of Figs. 1 and 7. Fig. 7 is a vertical longitudinal section on the line G, H, of Figs. 1, 5, and 6.

The same letters of reference indicate the same parts in the several figures.

It consists of a masonry furnace containing one or more fireclay retorts into which trays containing the powdered salt are introduced and are removed when the process of oxidation is completed. These retorts are built up of fireclay blocks or sections of convenient size and shape (as it has been found impossible to make the fireclay retort successfully in one piece) thus insuring durability, regularity of heat, and uniformity of result.

In putting our invention into practice we employ a furnace the preferred form being that shown in the accompanying drawings, and it is built of bricks or blocks of fire clay the side walls A' being built from the ground up. A horizontal floor b is built between the side walls near the lower part of the furnace and the underside of the said floor is arched as at b' for greater strength, below the said floor

is a longitudinal opening or flue a' through which the products of combustion pass from the fire box a which latter is situated below one end of the furnace. Upon the floor b is built a number of vertical walls I of fire brick, the said walls being placed at suitable distances apart to leave between them the spaces d, which form the retorts and the spaces g, through which the heat and products of combustion pass between the said retorts. These retorts d, of which preferably two or more are used in each furnace, (three being shown in the drawings,) consist of the vertical firebrick chambers d extending from end to end of the furnace, the firebrick walls I forming the sides of each chamber or retort having a number of parallel horizontal ribs i, i, i, for the full length of the retort, upon which ribs fit and slide freely the trays i containing the powdered material first described (a few of which are shown in the drawings). These trays i are made of convenient length and are pushed into the grooves between the ribs i one after another, until the whole of the retort has been filled in tiers one above the other. The firebrick walls I are braced by the ties f (also of firebrick) which extend across the spaces g and connect the two adjacent walls as shown in Fig. 1, space being left between them at g, g, g, for the circulation of the flame and hot air around the retorts as already described. The open fronts of the retorts, when the latter are filled with the trays as described, are closed by movable doors h, h, h, adjustable openings o, o, for the admission of air or steam being made in them. From the upper part of the other ends of the retorts made as described, metal pipes k, k, k, conduct away the acid vapor and gases to a tunnel or acid chamber l, or tower, in which the acids are condensed and collected to be utilized.

We provide the pipes between the retorts and the acid chamber, with openings m, m, m, through which they can be cleaned, the openings being provided with movable covers in the usual way. The tops of the retorts d are closed by slabs I' which fit closely upon the top edges of the walls I and have lateral extensions i² which are connected by suitable joints i³ with similar extensions upon the slabs of the adjacent retort thus helping to brace

and hold the structure firmly together. The top of the furnace is arched over as at *e* leaving a space or flue *e'* above the retorts into which the flues *g* between the retorts are open as shown in Fig. 7 through which the products of combustion pass to the smoke stack *e*³ as will be readily understood.

Supposing that the ferroferric or ferric oxides are to be obtained from crystallizable salts of iron such as sulphate chlorides, nitrates, and the like, we first calcine the salts in order to drive off the water of crystallization and we then reduce the resulting material to a fine powder by any suitable grinding or pulverizing machinery. We then take the resulting powder and place it in metal or other suitable trays in layers about one-quarter inch to one inch thick, and we introduce the trays into retorts of the kind hereinbefore described. In these retorts the powder is heated to a degree of temperature dependent upon the color of the resulting oxide required, greater heat producing darker color of the oxide, the time required being from about eighteen to about forty-eight hours. At the same time air (hot or cold) or steam is drawn over the surface of the powder by means of exhausting apparatus of any suitable kind, the acid being driven off from the material and the iron which forms its base being oxidized to the degree required. The acid passing off as described is conducted to a tunnel or tower or acid chamber of any of the usual kinds, by means of which it is concentrated and made marketable in the usual way.

Not only crystallizable salts of the kind described may be used but natural earth iron oxides, or oxides precipitated from solutions by any known chemical processes. In the case of some of these materials, it is evident that the preliminary process of calcination may be omitted.

We are aware that iron retorts have been tried, but have been unsuccessful, on account of the unequal action of the heat upon them, and the speedy wearing out of the iron.

By our invention in which the fireclay re-

torts are constructed in the manner described and shown they are very cheap, durable, and easily built, and they are very effective for the purpose required.

What we claim and desire to secure by Letters Patent of the United States is for producing ferroferric and ferric oxides:

1. In a furnace of the class herein described, the combination of a fire chamber, a floor of fire brick having flue openings therein above said fire chamber, walls *I* of fire brick built upon the said floor, alternate flues and retorts between said walls, longitudinal ribs upon the walls of the retorts, trays to slide in upon the said ribs, slabs *I'* which close the tops of the retorts; doors *h*, having ventilating openings *O*, which close the ends of the retorts, an acid chamber *l*; and pipes *k* communicating with the retorts and the acid chamber, substantially as and for the purpose described.

2. In a furnace of the class herein described, the combination of a fire chamber, a floor of fire brick having flue openings therein above said fire chamber, walls *I* of fire brick built upon the said floor, alternate flues and retorts between said walls, longitudinal ribs upon the walls of the retorts, trays to slide in upon the said ribs, means for closing the tops and ends of the retorts, pipes *k* for conducting the acid vapor from the retorts, ties *f* across the flues to brace the walls *I* and a chamber *e'* above the flues and communicating therewith to conduct the products of combustion away, substantially as and for the purposes described.

In testimony whereof we have hereunto set our hands in the presence of two witnesses.

ATKINSON CROSSLEY.

JAMES WILLIAM JONES.

Witnesses to the signature of Atkinson Crossley:

ARTHUR E. EDWARDS,

ALEX RIDGEWAY.

Witnesses to the signature of J. W. Jones:

JOHN A. LEAGAND,

Solicitor, Manchester.

J. E. HUNTZ,

His clerk.