(No Model.) 2 Sheets—Sheet 1.

L. J. B. A. J. BOUILLET.

MANUFACTURE OF ULTRAMARINE.

No. 398,375. Patented Feb. 26, 1889.

Fig. I.

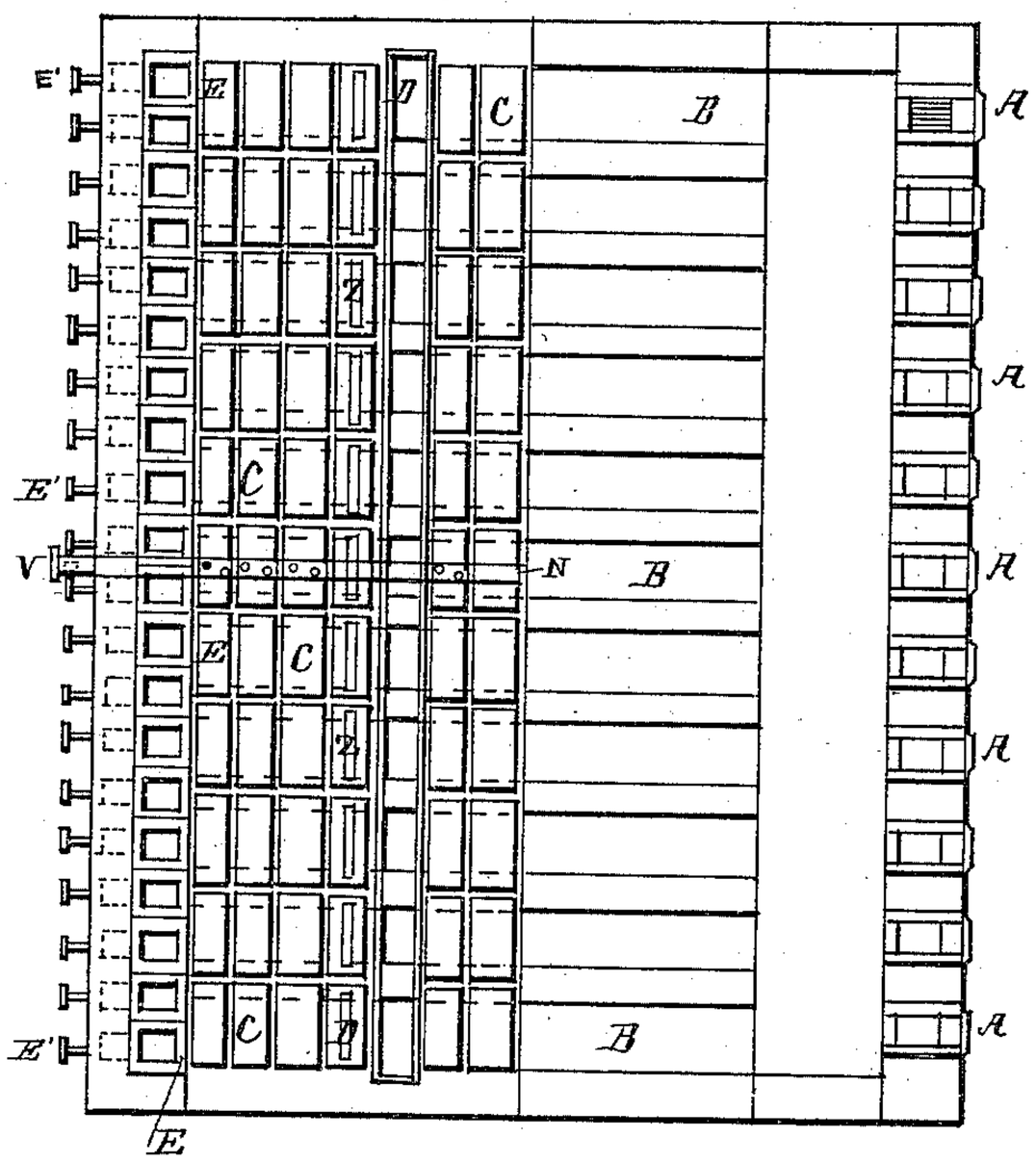
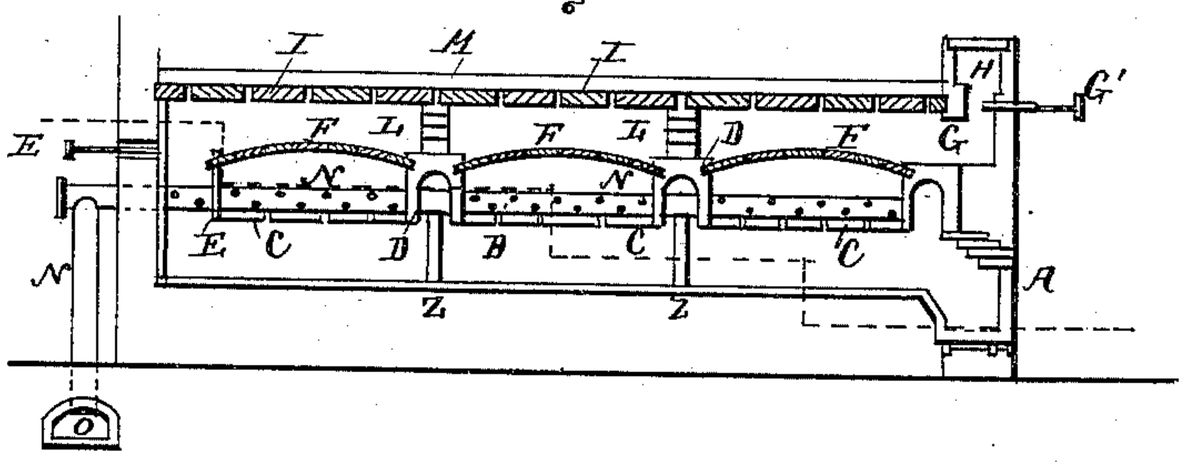


Fig. II.



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(No Model.) 2 Sheets—Sheet 2.

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Fig: III

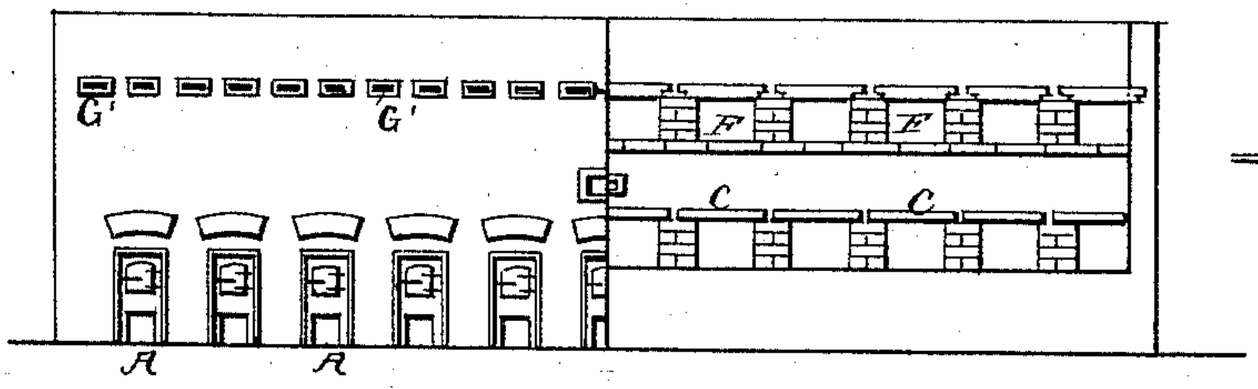


Fig: VII.

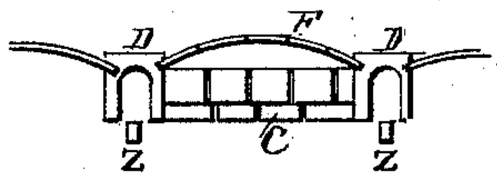


Fig: IV.

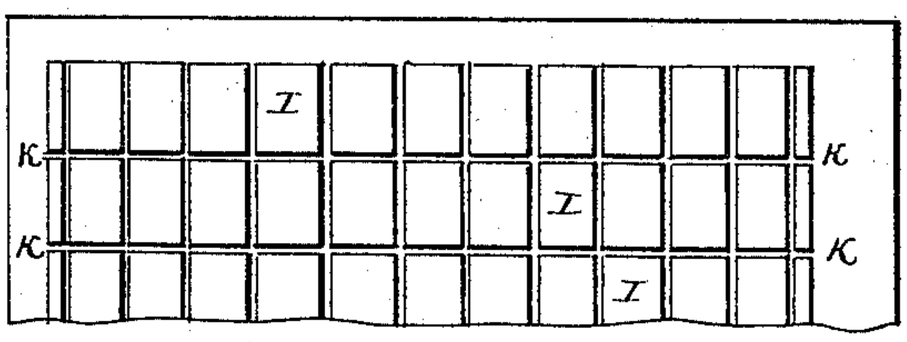


Fig. VI.

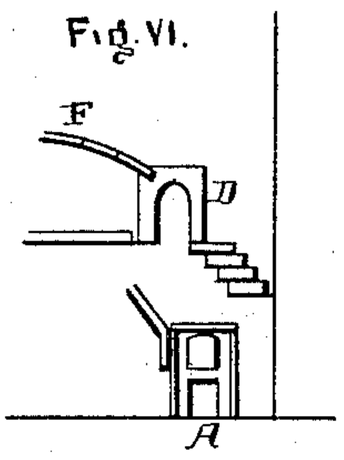


Fig: V

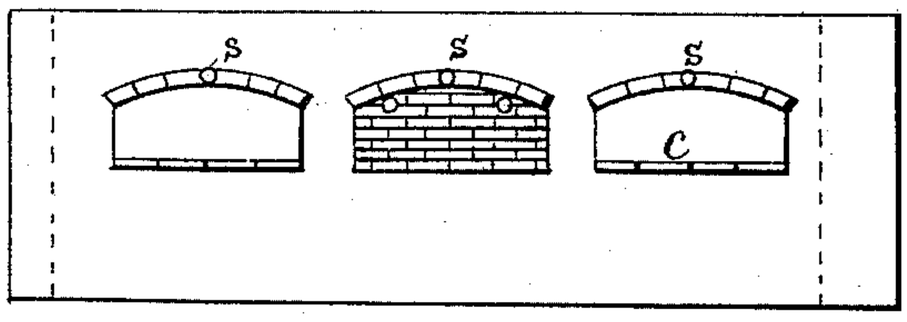
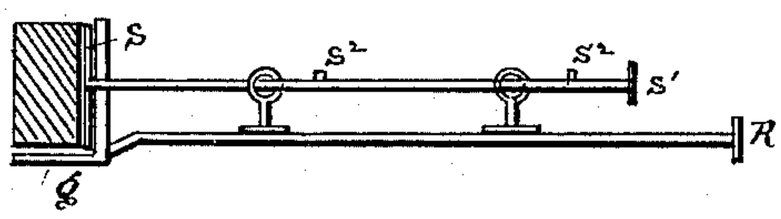


Fig: 8.



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James N. Lancaster

ATT'Y.

UNITED STATES PATENT OFFICE.

LÉON J. B. A. J. BOUILLET, OF LONDON, COUNTY OF MIDDLESEX, ENGLAND.

MANUFACTURE OF ULTRAMARINE.

SPECIFICATION forming part of Letters Patent No. 398,375, dated February 26, 1889.

Application filed March 25, 1887. Renewed December 18, 1888. Serial No. 294,023. (No specimens.) Patented in England July 14, 1886, No. 9,176.

To all whom it may concern:

Be it known that I, LÉON J. B. A. J. BOUILLET, of London, in the county of Middlesex, England, have invented certain new and useful Improvements in the Manufacture of Ultramarine, (for which I have obtained a patent in Great Britain, No. 9,176, dated July 14, 1886,) of which the following is a full, clear, and exact specification thereof.

This invention has for its object improvements in the manufacture of ultramarine, and in furnaces or ovens and apparatus to be used in this manufacture.

I prepare the materials, as usual, in a thoroughly mixed and finely-pulverized condition. I then proceed as follows: I provide molds, which may be of wood or other material, say about six inches square on the base and nine inches high; but the dimensions may be varied. In these molds I place paper bags or envelopes made of a size to fit the molds. I fill the bags with the powdered materials, giving meanwhile a continuous movement to the molds by means of a mechanical shaker or jigger to shake the powder down as closely as it will lie. When the paper packet or envelope is well filled, I cover the surface of the material with a thin sheet of wood or cardboard cut to fit the envelope. I then close the packet by folding over the paper and securing it with paste. I then remove the packet from the molds, for which purpose the bottom of the mold may be movable, and may be caused to rise, so as to eject the packet after it has been closed; or the delivery of the packet may be effected in any other convenient manner. The paper of which the envelopes are made should be stout and should contain much calcareous or mineral matter, so that it may effectually separate the packets when in the oven and prevent adhesion taking place in roasting or burning; or the paper may be dipped in a solution which will render it incombustible, and then dried. Having prepared a series of brick-like packets in the manner described, I place them within retorts or muffle-like chambers in a furnace or oven, such as I will presently more fully describe. I place the packets on end in the muffle by means of an instrument, which I construct specially for this purpose. It consists of a board with a handle attached and of a size to receive upon it a row of packets extending across the muffle. It is also provided with a pusher to displace the packets from the board and deposit them in place within the muffle. So I arrange in order row after row of packets until the muffle is full, when the end of the chamber is bricked up and the firing is proceeded with. The packets should be so placed in the muffle that the sheet of wood or card-board inserted into the envelope before closing it rests upon the floor of the muffle; then the blocks are prevented from adhering to the surface on which they rest. In consequence of the materials being arranged in packets as I have described, the gases which they give off when heated are able freely to escape, the materials become uniformly cooked throughout, and a better product is obtained than at present; besides which there is great saving of labor in charging the oven or furnace, and also in removing the goods. When the firing is completed, the materials will be found to have retained the brick-like form, and these bricks are easily removed from the muffle.

The furnace or oven is rectangular, and consists of a principal chamber with four side walls, a ceiling or roof, and a floor. The ceiling is formed of fire-tiles supported upon iron bars in such a manner that they can be easily removed to give access to the interior of the furnace-chamber to facilitate repairs. The floor is of brick-work or masonry, and across the floor from side to side there are a series of channels serving as flues. At one end of each channel at the side of the furnace-chamber there is a fire-place with bars on which fuel is burned; or in place of employing a series of fire-places there may be a single long fire-place passing from end to end of the furnace-chamber, and from which the flues already mentioned pass out laterally. Solid fuel may be employed, or gas or hydrocarbon liquid, the fire-place of course being adapted to the nature of the fuel which it is intended to burn. Over these flues I construct three or other number of muffles. They extend from end to end of the furnace-chamber. The fire-

tiles forming the floor or bottom of each muffle are laid over the flues, already described, and cover them in at the top. The sides of the muffles are composed of hollow blocks of fire-clay or refractory ware, and the roof of the muffle consists of a flat arch of thin fire-bricks abutting upon the blocks which form the side of the muffle, and covered with refractory cement to prevent the escape of gas. The heated products from the fire or fires, passing along the flues, impinge upon the under side of the floors of the muffles, and also enter the hollow blocks which form the sides of the muffle-chambers.

Refractory bricks are provided to deflect the flame and gas up into the interior of the hollow blocks. On reaching the extremities of the lower flues the heat ascends by numerous passages through the blocks which form the outer side of the muffle farthest from the fire. In this way the flames and gases from the fire reach the top of the muffles, and they then return over the arched roofs of the muffles to the side of the furnace, where the fire place or places are situated. A flue then leads them away to a chimney-stack. Regulators or dampers are provided in the passages connecting the flues on the under sides of the muffles with the space above their roofs, and there are also dampers in the numerous flue-passages, by which, after returning over the tops of the muffles, the products of combustion pass away. By means of these dampers the heat in every part of the furnace can be regulated, so that it may be made perfectly uniform throughout. The materials during the process disengage a large quantity of sulphurous vapors. In order to convey away these gases, I provide a pipe of fire-resisting pottery-ware. It passes across the bottoms of the muffles from side to side and is perforated for the gas to enter the pipes. The pipe passes out from the furnace at one side, and is connected with a flue in which a draft is maintained sufficient to carry away the gas and vapors, which are of a noxious character and unfit to be admitted into the atmosphere. Besides, the gas and vapor contain a considerable quantity of sulphur, which may be profitably retained. The gases may be purified by ways well known to chemists. I also connect with the muffles a pipe by which oxygen gas may be admitted to them when desired.

In order that my said invention may be most fully understood and readily carried into effect, I will proceed to describe the drawings hereunto annexed.

Figure I is a sectional plan showing the furnace-chamber and parts of the muffles which it contains. Fig. II is a transverse and vertical section. Fig. III is a side elevation, partly in section. Fig. IV is a plan of a portion of the roof or ceiling of the furnace. Fig. V is an end elevation. Fig. VI is part of a vertical section, showing the arrangement when a single fire-place is employed. Fig. VII is a transverse section through one of the muffles and shows the goods in the form of brick-like packets arranged within it. Fig. VIII is a side elevation of the apparatus which I employ in placing the packets in the muffles.

A A are the fire-places.

B B are the series of flues, into which the heated products from the fires pass.

C C are the fire-tiles, forming the bottom of the muffles, and which inclose the flues B at the top.

D D D are hollow fire-brick or refractory blocks forming the sides of the muffles. They are so formed that the heat from the flues may circulate within them, so that the sides of the muffles, as well as the bottoms and tops, may be effectually heated.

Z Z are refractory bricks deflecting the flames and gases upward into the interior of these blocks.

E E are the blocks, which form the outer side of the farther muffle. They are different in form from the blocks D, and by them the flames and gases from the fire can pass up into the space above the muffles.

E′ E′ are dampers by which the passages in the blocks E can at pleasure be closed.

F F F are the arches of fire-tile, forming the roofs of the muffles. They abut upon the blocks D and E, as the drawings show.

G G are the flue-passages by which the products of combustion pass out from the furnace-chamber into a flue, H, leading to a chimney.

G′ G′ are dampers in the flue-passages G.

I I are fire-tiles which close the furnace-chamber at the top. They are supported by iron bars K. The bars K are T form in section, and are supported upon the side walls of the furnace, and also upon brick piers L L, built on the tops of the hollow fire-brick blocks D D.

M is a layer of sand, which is laid over the top of the ceiling-blocks I.

N is a pipe of fire-resisting pottery passing through the muffles, and the part of the pipe within the muffles is perforated, so that the gas generated in the muffles may enter it.

O is the flue into which the pipe N leads. The muffles are open at both ends for the material inclosed in packets or envelopes, as described, to be arranged in the way clearly shown in Fig. VII, where P P represent a row of six packets standing on end upon the muffle-bottom. The packets are placed six at a time and row by row until the muffle is full. When the muffles are charged, they are bricked up at the ends, sight-holes only being left, as indicated in Fig. V. All of the muffles being thus filled and closed, the fires are lighted, and gradually the muffles are brought to the requisite high temperature, which is such as is at present usual to employ in this manufacture; but the arrangements of my furnace admit of greater regularity in the heating than has heretofore been possible. After fir-

ing, the muffles are allowed to cool, and during the cooling I prefer to admit oxygen gas at the apertures *s s*. The material absorbs the gas and then assumes the brilliant blue hue which is usually desired in the finished product.

In place of supplying oxygen, air may be admitted by the openings *s;* but I prefer to use oxygen, as a finer color is so obtained. The muffles are allowed to get nearly cold before they are opened, the goods are then removed, and the product of ultramarine-blue is prepared for the market in the usual manner.

In Fig. VIII, Q is the board or surface on which a row of six or other number of packets is arranged for insertion into the muffle. R is the handle. S is the pusher by which the packets are displaced from the board. S′ is the handle of the apparatus.

The way of employing this apparatus will be readily understood. When loaded, it is inserted into the muffle, and when the packets are in place the handle S′ is pressed forward and the handle R drawn back. Stops at S^2 limit the movement.

I am aware that various forms of retorts or crucibles have heretofore been made for the production of metals, &c.; but I am not aware that they were ever before provided with a perforated incombustible pipe leading from the interior thereof; neither am I aware that they were ever constructed substantially the same as the invention herein shown and described.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

1. The method of manufacturing ultramarine by first placing the powdered material in a fibrous bag or envelope containing calcareous or mineral matter while in constant motion, then placing a thin sheet of card-board over the material, and folding the paper bag or envelope over the card-board and sealing it with paste, the whole placed within a suitable retort and subjected to a proper degree of heat, substantially as described.

2. The combination, substantially as shown and described, of the fire-places A, flues B, fire-tiles C, hollow fire-bricks D, refractory bricks Z, blocks E, dampers E′, arches F, flue-passages G, dampers G′, flue H, fire-tiles I, iron bars K, brick piers L, layer of sand M, perforated incombustible pipe N, flue O, and apertures *s*, the whole adapted for the manufacture of ultramarine.

In testimony that I claim the foregoing I have hereunto set my hand this 8th day of December, 1886.

LÉON J. B. A. J. BOUILLET.

Witnesses:
MILTON RADFORD,
TOM PREECE,
Both of 35 Queen Victoria Street, London, E. C.