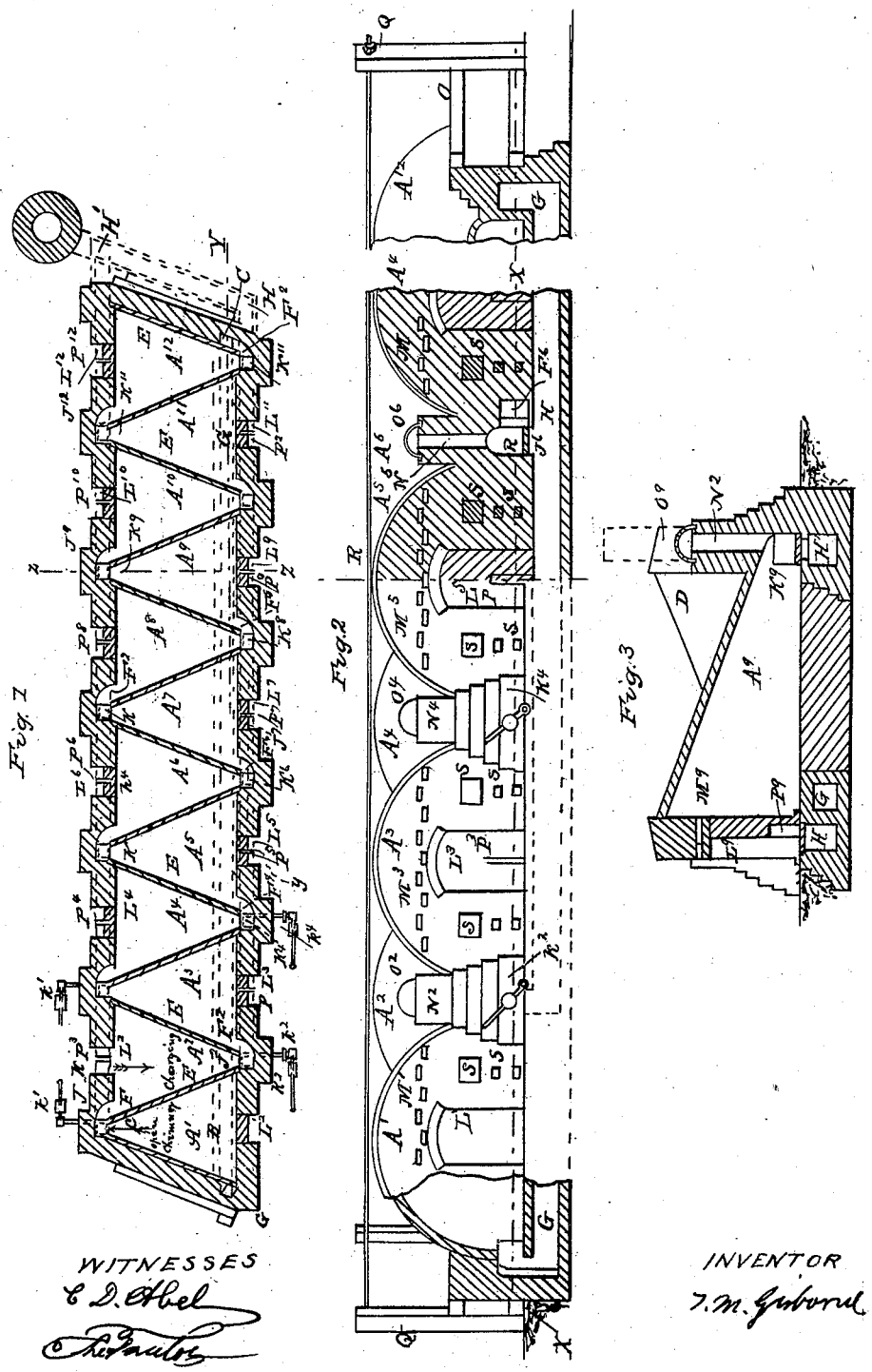
T. M. GISBORNE.

Brick Kiln.

No. 52,801. Patented Feb. 20, 1866.



WITNESSES

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THOMAS MATTHEW GISBORNE, OF LYMINGTON, ENGLAND.

IMPROVED BRICK-MACHINE.

Specification forming part of Letters Patent No. **52,801**, dated February 20, 1866.

To all whom it may concern:

Be it known that I, THOMAS MATTHEW GISBORNE, of Lymington, in the county of Southampton, in the kingdom of Great Britain, have invented Improvements in Kilns for Burning Bricks, Tiles, and ether Earthenware or Ceramic Articles, Limestones, and Ores; and I do hereby declare that the following is a full and exact description of the said invention.

My invention consists in so combining a number of kilns, working on the principle of the "Newcastle kiln," (in which the combustion of the fuel takes place at the one end while the chimney communicates at or near the floor with the other end,) that the back or chimney end of one kiln can communicate at pleasure with the front or combustion end of another kiln, or with a separate chimney or flue, so that the kilns may either be used separately, or they may be employed for continuous burning by causing the hot products of combustion from the kiln that is being fired to pass among and heat the contents of one or more kilns that are going to be fired, and by causing the air for supporting the combustion in the kiln that is being fired to pass through and take up heat from the contents of one or more kilns that have been fired.

The arrangement which I prefer to employ is as follows: I arrange any number of kilns, constructed, by preference, to taper from the front or combustion end to the back or chimney end, side by side and alternately in reversed positions, so that the chimney end of one kiln is contiguous to and communicates with the combustion end of the next kiln in advance. The aperture through which this communication takes place is provided with a suitable damper, which, when the kilns are burning on the continuous system, is removed, while the chimney or flue is then closed, whereas, when the kilns are required to burn separately the communication between them is closed by means of the before-mentioned damper, and the chimney is opened. The continuous action of such kilns is insured, either by providing a return-flue through which the two end kilns intercommunicate, or by arranging two rows or sets of such kilns side by side, and establishing communications between the end kilns of each row.

On the accompanying drawings are shown the arrangements of my improved kilns which I prefer to employ.

Figures 1, 2, and 3, on Sheet I, show, respectively, a sectional plan, a part sectional elevation, and a transverse section of a single row of kilns working on the continuous principle by means of a return-flue; and Figs. 4 and 5, on Sheet II, show, respectively, a sectional plan and transverse section of an arrangement where the continuous action is obtained by means of two rows of kilns placed opposite each other, of which the opposite end kilns intercommunicate by means of flues.

The same letters of reference indicate similar parts in each of the figures.

Figure 1 shows a sectional plan on line X X, Fig. 2. Fig. 2 shows a part front elevation and part longitudinal section on line Y Y, Fig. 1; and Fig. 3 shows a transverse section on line Z Z, Fig. 1. Figs. 2 and 3 are drawn to twice the scale of Fig. 1 in order to show the mode of construction more clearly.

Each of the kilns consists of a chamber, A, tapering both in its width and its height from the front or combustion end, B, to the chimney end, C, the roof D of the kiln being thus, by preference, made to form the frustum of a cone resting upon walls E. These are made as thin as practicable, in order to facilitate the transmission of heat through the same from one kiln to another. These kilns are arranged side by side, alternately, in reversed positions, as shown, so that the front or combustion end of the one kiln is contiguous to the chimney end of the next, and the chimney end of the kiln A' is made to communicate with the combustion end of the kiln A^2 by means of a passage F'. The chimney end A^2 communicates, by means of the passage F^2, with the combustion end of the kiln A^3, and so on, the chimney end of the kiln A^{12} being made to communicate with the combustion end of the kiln A' by means of the passage F^{12} and the underground-flue G.

H H′ are flues formed below the floor-line on either side of the kilns, communicating with the chimney I and with each of the kilns, respectively, through apertures J' J^2 J^3, formed in the floor at the chimney ends of the latter. These apertures are provided with dampers or with flap-valves K' K^2 K^3, so arranged and actuated by external weighted levers k' k^2 k^3 that they may be made to close, alternately, the

apertures $J' J^2$, or the apertures of the before-described passages $F' F^2 F^3$, through which the kilns intercommunicate by being turned either down or up.

$L' L^2 L^3$ are the doorways of the kilns, which, when the kilns are in use, are temporarily bricked up, as indicated.

$M' M^2 M^3$ are apertures through which the fuel is introduced into the kilns when burning on the continous system, and which are, by preference, all temporarily bricked up, excepting those in the kiln that is being fired; and $N' N^2 N^3$ are chimneys only required for use when the continuous action of the kiln is interrupted.

When burning on the continuous system, the chimneys N are closed by suitable dampers or caps $O' O^2 O^3$.

It will be seen by the foregoing-described arrangement that the action of the kilns is as follows: Assuming that the kiln A^2 is being charged with fresh goods, and that the contents of A^8 are being fired, then the goods contained in all the kilns between A^2 and A^8 have been successively fired and are required to cool, while all the remaining kilns in the circuit from A^8 to A^2 have been successively charged with fresh goods, and are required to dry preparatory to firing. For this purpose the apertures J into the flues H H′ of all the kilns are closed by means of the dampers K, with the exception of the aperture J' of the kiln A', and in consequence all the passages F, through which the kilns intercommunicate, are open, with the exception of F', which is closed by the damper K'. Thus the doorway L^2 of the kiln A^2 being open, the atmospheric air requisite for supporting the combustion of the fuel in the kiln A^8 passes into the kiln A^2, and through the passage F^2 into the kiln A^3, where, in traversing the ware set in the same on its way to the kiln A^4, it takes up a portion of the heat therefrom. In like manner, in traversing the kilns $A^5 A^6 A^7$, the air takes up more and more heat from their contents, and arrives in a highly-heated state in the front end of the kiln A^8, where it consequently effects the combustion of the fuel that is fed in through the openings M^8, a horizontal bag or passage with graduated openings being provided through which the hot gases are caused to pass in a uniform manner into the kiln. In some cases instead of introducing the fuel, as described, into the kiln that is to be fired, it is introduced into the narrow or chimney end of the preceding one—that is, the one that has just been fired. The goods contained in the kiln are fired and baked the more effectually on account of the kiln being made to taper, both in width and height, toward the exit-passage for the gases. The highly-heated gaseous products of combustion pass from the kiln A^8 into the kiln A^9, where they impart a portion of their heat to the goods that are drying preparatory to being burnt, and in like manner the hot gases pass consecutively through and impart heat to the kilns $A^{10} A^{11} A^{12}$, and thence through the passage G into the kiln A', whence, after traaversing the contents of the same, they pass through the aperture J' into the underground-flue H′, and thence into the chimney I.

When the kiln A^2 has been charged or set with fresh goods and the firing of the contents of A^8 has been completed, the doorway L^2 is bricked up in the ordinary manner, the damper K^2 is removed from the aperture J^2, and the passage F^2 is closed, the aperture J' being also closed by the damper K', thus, also, establishing the communication between the kilns A' and A^2. At the same time the contents of the kiln A^3, having been cooled down sufficiently by the passage of cold air, as before described, the doorway L^3 is opened, the goods are removed, and the kiln is charged with fresh goods. Atmospheric air now passes into this kiln, traverses the kilns A' to A^8, and arrives in a highly-heated state in the kiln A^9, into which fuel is now introduced, and the contents of which are consequently fired. The products of combustion are made to traverse the kilns A^{10} to A^2, whence they pass away to the chimney I. Thus it will be seen that each kiln is successively charged or set, dried, fired, cooled, and discharged in rotation, the heat from the products of combustion from the kiln that is fired being usefully employed in drying fresh goods, while the heat from the fired groods is taken up by the air required for supporting combustion.

Instead of having only one kiln open in the above-described arrangement for discharging and charging the goods, two—for instance A^2 and A^3—may be open simultaneously, so that at the same time that A^2 is being set with fresh goods A^3 is being emptied preparatory to being set, which simultaneous operation is greatly facilitated by the reversed positions of the doorways, preventing the men employed in setting from being in the way of those discharging. If from any cause the continuous action of the series of kilns is interrupted, or it is desired to burn each kiln separately in the ordinary manner, then either the whole of the passages F, through which they intercommunicate, are closed by the dampers K, and thus a direct separate communication with the chimney I is established for each kiln through the apertures J and flues H H′; or, if these flues and the chimney I cannot be made use of, the caps $O' O^2 O^3$ are removed from the chimneys $N' N^2 N^3$ and an iron or other flue is placed upon these, as indicated by dotted lines in Fig. 3, so as to cause the requisite draft for the kiln to burn in the ordinary manner; and in order to cut off the communication with the chimney I, either horizontal dampers (not shown in the drawings) are inserted over the openings J, or vertical dampers are placed across the flue H H′ at $P^2 P^3$, as shown, the fuel for burning in the ordinary Newcastle manner being then introduced at the openings S S, which, when the kilns are continuously burning, may be bricked up.

It will be seen that by means of the just

described extra dampers, and by forming additional openings into the flues H H′, as indicated by dotted lines at T in kiln A^{12}, also provided with dampers, the continuous burning of the kilns may proceed uninterruped, while two, or any even number, may be either partially or wholly thrown out of circuit for the purpose either of preparatory drying, drawing, setting, or repairs. This is effected—if, say, A^{10} and A^{11} are to be disconnected—by closing the openings J^{10} and J^{11}, F^9, F^{10}, and F^{11}, and inserting the damper at P^{12}, when, the apertures J^9 and T being open, it will be evident that the draft from the kiln A^9 will descend into H′ through J^9, and will enter A^{12} through T. Although twelve kilns are shown in this arangement, by way of example, it will be evident that any greater or less number may be employed; and if an uneven number of kilns be used, in which case the two end kilns will lie in the same direction, then the flue G, through which these kilns intercommunicate, will pass diagonally across from the chimney end of the one kiln to the combustion end of the other, instead of running parallel with the kilns, as in the arrangement shown. The roofs of the kilns are provided with suitable apertures (not shown) fitted with dampers for letting the steam escape, if requisite. For banding, wooden beams Q Q are fixed against the end walls of the kilns, and are tied together by means of iron tie-rods R R, so as to support the structure, and other transverse ties and plates are added where necessary.

The arrangement shown in Figs. 4 and 5 only differs from that above described in there being two rows of kilns to form the circuit instead of one row and a return-flue. Fig. 4 shows a sectional plan on line X X, Fig. 5, and Fig. 5 shows a transverse section on line Y Y, Fig. 4. The various details are precisely the same, and are indicated by similar letters of reference to those employed in the foregoing arrangement. The two rows are so arranged that the chimney end of the kiln A^{14} communicates with the combustion end of the kiln A^{15} through the flue G, and the chimney end of the kiln A^{28} communicates with the combustion end of the kiln A′ by means of the flue G′. The circuit being thus established, it will be seen that if A^5 is charging and A^6 is discharging in one row, and A^{19} is charging and A^{20} discharging in the other row, and assuming that the goods in the kilns A^{14} and A^{28} are being fired, and that the dampers K of the kilns have been closed upon the apertures J, with the exception of K^4 and K^{13}, which are made to close the passages F^4 and F^{13}, then the air passing in through the kiln A^6 to support the combustion of fuel in A^{14} will traverse the contents of all the kilns from A^7 to A^{13} that have been fired, taking up the heat therefrom, while the hot gaseous products of combustion, after passing from A^{14} across through the flue G, will traverse the kilns A^{15} to A^{18}, whence they pass into the flue H^3 and to the chimney I. In like manner the air required to support the combustion of fuel in A^{28} will pass into the kiln A^{20}, will traverse all the intermediate kilns, taking up heat from the goods contained therein, while the hot gaseous products of combustion will, after passing from A^{28} across through the flue G′, traverse all the kilns from A′ to A^4, giving off the greater portion of their heat, and pass thence to the chimney I through the flue H^2.

Fig. 6 shows a transverse section, and Fig. 7 shows a part sectional plan of another arrangement of which my invention is susceptible. In this arrangement a number of kilns, A, made to taper from the combustion end to the chimney end, are placed side by side, but not in reversed positions, so that together they form a circle, as shown. Each kiln is made to communicate, through the apertures J, with the central chimney, I, the communication between the chimney end of the one kiln and the combustion end of the next being effected by the return-flues F. In burning on the continuous system all apertures J are closed by dampers or valves at K, with the exception of that of the kiln which is required to communicate with the chimney, while all the flues F are open with the exception of that communicating with the combustion end of the kiln that is being charged or discharged which is closed by means of a damper at K′. If each kiln is burning separately, then all the dampers at K are open and all those at K′ are closed. Each kiln may, if necessary, be further provided with a separate chimney, as in the other arrangements.

Having now described the nature of my invention and the best means I am acquainted with of performing the same, I wish it to be understood that I do not limit myself to the precise form and arrangement of the kilns, as hereinbefore described with reference to the accompanying drawings, as these may be variously modified without departing from the nature of my invention; neither do I claim, generally, the arrangement of a number of kilns placed side by side, and intercommunicating in such a manner that the air for supporting combustion in the kiln that is being fired first passes through one or more kilns that have been fired, while the products of combustion pass through the kilns that are going to be fired, as I am well aware that this has already been done; but

What I claim is—

1. Arranging a series of kilns burning on the principle of the Newcastle kiln side by side, in such a manner that the front or combustion end of the one kiln is contiguous to and can communicate with the back or chimney end of the next kiln, while the chimney end of each kiln can, furthermore, communicate either with a chimney common to all or with a separate chimney.

2. Constructing a series of kilns burning on the principle of the Newcastle kiln placed side by side, and made to taper from the combustion end to the chimney end, the chimney end

of one kiln being made capable of communicating either with the combustion end of the next kiln or with a common or separate flue or chimney.

3. Constructing a series of kilns burning on the principle of the Newcastle kiln made to taper from the combustion end to the chimney end, and arranged side by side alternately in reversed positions, the chimney end of the one kiln being made capable of communicating either with the combustion end of the next kiln or with a common or separate flue or chimney.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

THOMAS MATTHEW GISBORNE.

Witnesses:

C. D. ABEL,

THOS. TAYLOR.