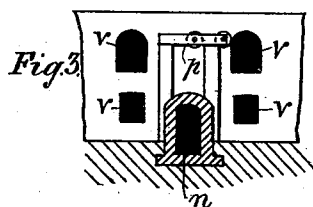
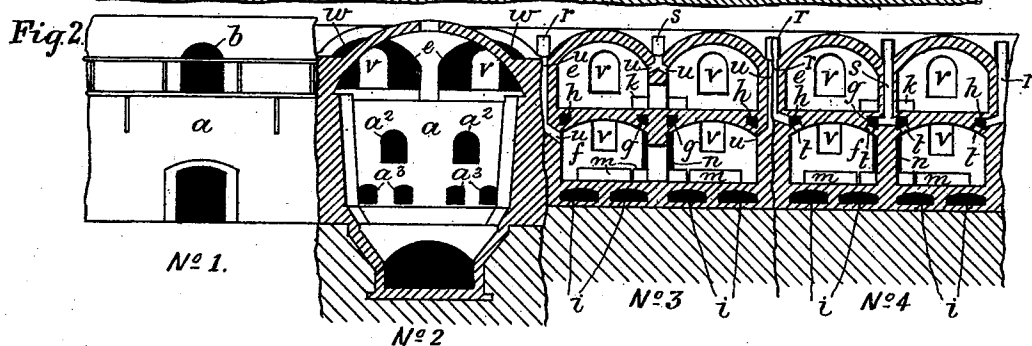
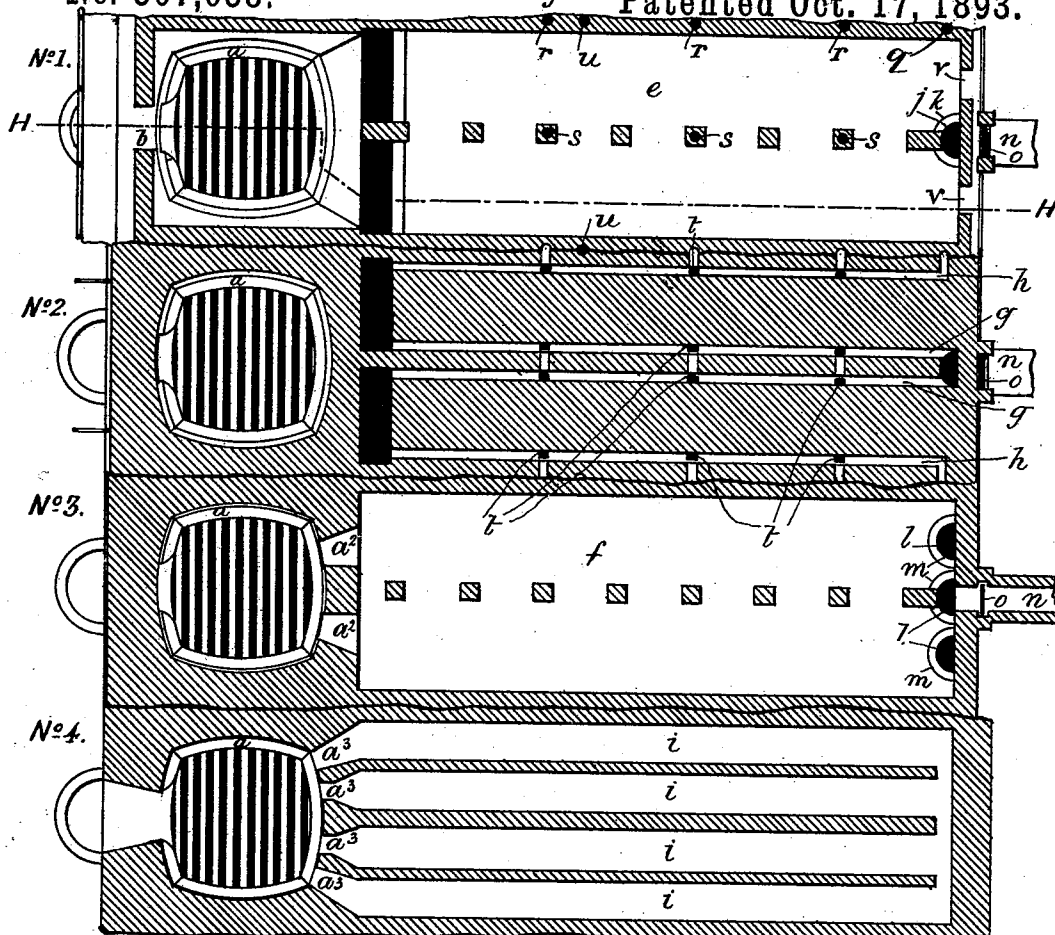


G. BATCHELOR.

ARRANGEMENT FOR DRYING SLURRY BY WASTE HEAT FROM  
CEMENT KILNS.

No. 507,058.

Fig. 1. Patented Oct. 17, 1893.



Witnesses  
William Thomas Whitteman  
Lucy Charles Rushen

Inventor  
George Batchelor

(No Model.)

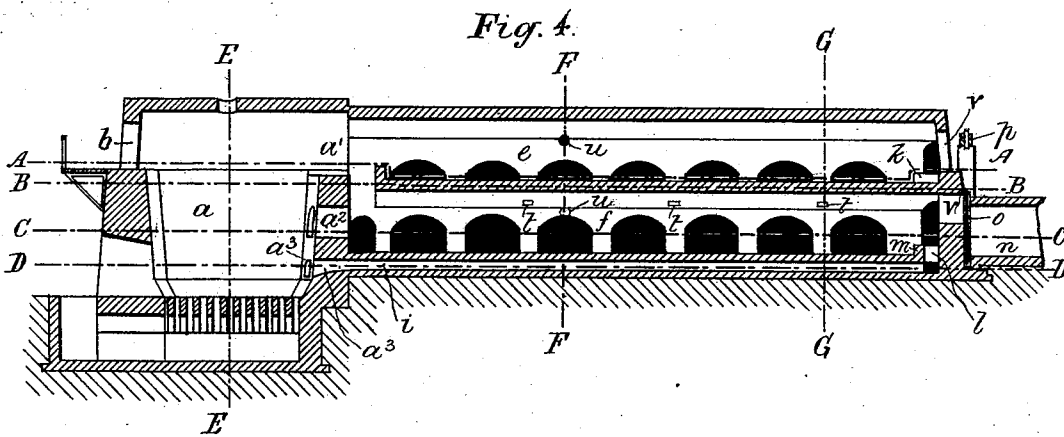
2 Sheets—Sheet 2.

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# UNITED STATES PATENT OFFICE.

GEORGE BATCHELOR, OF FUNDSBURY, ENGLAND.

ARRANGEMENT FOR DRYING SLURRY BY WASTE HEAT FROM CEMENT-KILNS.

SPECIFICATION forming part of Letters Patent No. 507,058, dated October 17, 1893.

Application filed March 2, 1893. Serial No. 464,404. (No model.) Patented in England March 12, 1889, No. 4,333, and July 10, 1889, No. 11,128.

*To all whom it may concern:*

Be it known that I, GEORGE BATCHELOR, a subject of the Queen of Great Britain, residing at Fundsbury, England, have invented certain new and useful Improvements in Arrangements for Drying Slurry by the Waste Heat from Cement-Kilns, (for which I have obtained Letters Patent of Great Britain No. 4,333, dated March 12, 1889, and No. 11,128, dated July 10, 1889;) and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to such arrangements for drying slurry as consist of chambers communicating with the interior of a cement kiln in which chambers the slurry is dried by the products of combustion of the fuel in the kiln which are caused to pass through the said chambers and my said improvements consist in constructing and arranging the said chambers and providing for the heating thereof by means of the said products of combustion as hereinafter described.

According to my said improvements I form at the back of each kiln two chambers one above the other which chambers are of such length and breadth that the joint areas of the floors of the said two chambers are sufficient to admit of the quantity of slurry required for one charge of the kiln being spread on the said floors in layers of such depth as to insure the drying of the whole of the said quantity of slurry during the burning of one charge in the kiln and by means of the products of combustion passing from the kiln. I form the said two chambers of sufficient height internally to admit of men entering and working in them when the dried slurry is required to be removed from the floors and I form the floor of the upper chamber at about the height of the top of the pan of the kiln and the floor of the lower chamber at a height intermediate between the top and bottom of the pan of the kiln and I form flues beneath the said floors. I incline the said floors slightly toward the kiln so that when covered with liquid slurry the depth of the layer of slurry on each of the floors is greatest at the end adjacent to the kiln and gradually de-

creases toward the farther end. To provide for the passage of the products of combustion from the kilns into the aforesaid chambers and flues I form openings and passages in the backs of the kilns which passages communicate with the said chambers and flues and to provide for the passage of the said products of combustion from the said chambers and flues I form other openings and passages at the farther ends of the said chambers and certain of the said flues, which latter openings and passages communicate with the chimney shaft and are provided with dampers or other means of closing or obstructing them when necessary. The other of the said flues communicate with shafts opening above the upper chamber. I provide the chambers with arched roofs preferably of brick and concrete and I form the roof of each of the said chambers of two rows of arches supported by the outer walls of the chambers and by a row of piers built on the floors thereof. The hollow or valley formed by the arches of the roof of the upper chamber and the hollows or valleys between the several arched roofs where the chambers are applied to a series of kilns built side by side constitute tanks for containing wet slurry which when the floors of the chambers are to be charged with slurry is allowed to flow onto them from the said tanks through shafts or passages formed in convenient parts of the arched roofs and the walls supporting them which shafts or passages are at other times closed by suitable means.

To provide for rapid cooling and ventilation of the chambers when it is required to remove the slurry dried therein I form openings in those of the walls of the aforesaid chambers which are at or near the ends farthest from the kiln and I form shafts in the side walls of the upper chambers and in the piers which support the roofs of the said chambers which shafts open above the roofs of the upper chambers and communicate at their lower parts with the flues beneath the floor of the upper chambers and through the said flues with the interior of the lower chambers. For the purpose of preventing the passage through the said openings and shafts of heated air from the drying chambers while slurry is being dried on the floors of the said

chambers I provide the said openings and shafts with suitable dampers or shutters or I otherwise provide for closing them.

My said improvements are illustrated in the accompanying drawings, in which—

Figure 1 represents in horizontal section four kilns of a row of kilns and the drying chambers connected thereto the several kilns being marked respectively No. 1, No. 2, No. 3, No. 4. Fig. 2 represents one of the said three kilns in front elevation and the kiln adjacent thereto in vertical section and the drying chambers of the other two kilns also in vertical section. Fig. 3 is a back elevation of the drying chambers at the back of one of the kilns the flue leading to the chimney shaft being in section and Fig. 4 is a longitudinal vertical section of the kiln No. 1 and the drying chambers at the back thereof.

The lines on which the several sections are taken are as follows: The section of the kiln No. 1 and its drying chambers shown in Fig. 1 is taken on the line A A Fig. 4. The section of the kiln No. 2 and its drying chambers also shown in Fig. 1 is taken on the line B B Fig. 4. The section of the kiln No. 3 and its drying chambers also shown in Fig. 1 is taken on the line C C Fig. 4. The section of the kiln No. 4 and of the parts at the rear thereof which section is also shown in Fig. 1 is taken on the line D D Fig. 4. The section of the kiln No. 2 shown in Fig. 2 is taken on the line E E Fig. 4. The section of the drying chambers of the kiln No. 3 shown in Fig. 2 is taken on the line F F Fig. 4. The section of the drying chambers of the kiln No. 4 shown in Fig. 2 is taken on the line G G Fig. 4 and the section Fig. 4 is taken on the line H H Fig. 1.

In the following description the said drawings are referred to by the letters and figures marked thereon. The same letters and figures of reference indicate the same parts in all the figures of the drawings.

*a a* are the kilns the tops of which are covered with arched roofs and provided with loading eyes as usual the loading eye of the kiln No. 1 being shown in the drawings and marked *b*. The several drying chambers which are shown in the drawings are marked *e f*; *e* being the upper chambers and *f* the lower chambers. The said chambers are of such length and breadth that the joint areas of the floors of the upper and lower chambers at the back of each kiln are sufficient to admit of the quantity of slurry required for one charge of the kiln being spread on the said floors in layers of such depth as to insure the drying of the whole of the said quantity of slurry by means of the products of combustion passing from the kiln during the burning of one charge therein. The roofs of the said chambers are each formed of two arches supported by the outer walls of the said chambers and by piers rising from the floors thereof.

*g g* and *h h* are the flues beneath the floors of the upper chambers and *i i* are the flues

beneath the floors of the lower chambers. In building the said drying chambers I incline the floors thereof toward the kiln but on account of the small scale to which the accompanying drawings are made the inclination of the floors is not shown therein. I have found that an inclination of about one in three hundred or an inclination of about two inches in a chamber of about forty five feet long is sufficient.

The openings and passages by which the gases or gaseous products of combustion from each of the kilns pass into the contiguous drying chambers and flues are hereinafter described. The said gases pass into the upper drying chamber and the flues *g g h h* through an opening between the arched roof of the kiln and the upper part of the pan of the kiln which opening is shown in Figs. 1 and 4 with respect to the kiln No. 1 and in Fig. 2 with respect to the kiln No. 2 and is marked *a'* in the said Fig. 4. The said gases also pass into the lower drying chamber through openings and passages *a''* formed in the backs of the kilns and into the flues *i i* beneath the floor of the lower chamber through openings and passages *a'''* in the backs of the kilns. The openings and passages and flues by which the said gases pass from the said chambers and from the flues beneath the drying floors and the arrangement of the dampers in the flues leading to the chimney shaft are hereinafter described. The gases from the upper chamber of the pair of chambers connected to each kiln and the gases from the flues *g g* beneath the floor of the upper chamber pass downward into the lower of the said pair of chambers through an aperture *j* in the floor of the said upper chamber having a low wall *k* built at its edge to confine the slurry. The gases from the flues beneath the floors of the lower chambers pass upward through apertures *l l* in the floors of the said chambers at the edges of which apertures low walls *m m* are built to confine the slurry on the said floors. The gases which pass through the lower chambers *f, f* and the gases which pass into the said chambers from the flues *i i* and from the upper chambers *e e* pass from the chambers *f f* by flues *n n* provided with dampers or shutters *o o* and connected to the chimney shaft which is not shown in the drawings. To facilitate the raising of these dampers when necessary in order to admit of the passage of the gases from the kilns through the drying chambers and the flues to the chimney they may be counterbalanced or partially counterbalanced by means of a weight suspended by a chain connected to the said damper and passing over pulleys suitably supported as shown at *p* in Figs. 3 and 4. The gases from the flues *h h* beneath the floors of the upper chambers pass into shafts formed in the side walls of the said chambers and opening above the roofs thereof one of which shafts is shown at *p* in Fig. 1.

*r r* and *s s* are the shafts for ventilating

the chambers *f, f* for the purpose of cooling them prior to the removal of slurry which has been dried therein. As shown in the drawings the shafts *r r* are formed in the side walls of the chambers *e e* and the shafts *s s* in the piers supporting the roofs of the said chambers *e e*. The said shafts are carried up some distance above the said roofs as shown in Fig. 2 and are open at their upper ends.

*t t* are openings or passages in the arched roofs of the lower chambers *f f* which openings communicate between the flues *g g h h* and the said lower chambers and admit of the passage of heated air and gases therefrom into the said flues.

The closure of the ventilating shafts *r r s s* as required when slurry is being dried in the chambers may be effected by placing tiles or slabs or plates of any non-combustible material on the upper ends of the said shafts.

The portions of the arched roofs of the upper drying chambers which I use as tanks for containing wet slurry are the hollows or valleys of the said roofs seen in Fig. 2.

*u u* are the shafts or passages through which the slurry is allowed to flow from the said tanks onto the floors of the drying chambers when required. When the kiln is in action the said shafts or passages *u u* may be closed by any convenient means.

*v v* are the openings formed in the end walls of the drying chambers for the purpose of ventilating them when necessary which openings and also those at the ends of the upper drying chambers above the roofs of the kilns (which openings are shown at *w w* in Fig. 2) are closed by shutters or other suitable means when the kilns are in action.

Although in the accompanying drawings I have shown my invention as applied to a row

of kilns built side by side I would observe that it is equally suitable for application to kilns built separately.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I wish to be understood that I do not limit myself to the precise details of construction hereinbefore described, but I declare that

I claim—

1. The combination with a cement kiln, of a pair of slurry drying chambers located one above the other at the back of said kiln, the floor of the upper drying chamber being about on a level with the top of the pan of the kiln, and the floor of the lower drying chamber being at a height intermediate between the levels of the top and bottom of the pan of the kiln, and the said upper chamber being in communication with the space between the top of the pan of the kiln and the roof of the kiln, and the said lower chamber being in communication with the interior of the pan of the kiln, and both the said chambers being also in communication with a flue leading to a chimney shaft, substantially as described.

2. The combination with a cement kiln, of a pair of slurry drying chambers located one above the other at the back of said kiln and communicating therewith and with a chimney flue, the floors of said drying chambers being inclined and provided with flues *g, h, and i*, and said chambers being also provided with ventilating passages and with inlets *u* for wet slurry, substantially as described.

GEORGE BATCHELOR. [L. S.]

Witnesses:

LEONARD WILLIAM JENKINS,  
ERNEST WALTER DELAROCHE.