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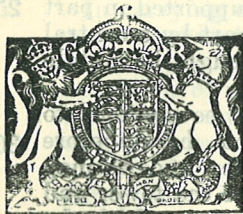
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Improvements in
Acid-Concentrating
and like Towers

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24 OCT 1929

PATENT SPECIFICATION



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PROVISIONAL SPECIFICATION.

Improvements in Acid-concentrating and like Towers.

We, PHILIP HOWARD EVANS, Lieutenant-Colonel, R.A., British subject, and RICHARD CHARLES BOWDEN, Ph.D., M.Sc., F.I.C., British subject, both of Royal Gunpowder Factory, Waltham Abbey, Essex, do hereby declare the nature of this invention to be as follows:—

This invention relates to towers with particular reference to such as are employed for concentrating sulphuric acid and for like purposes.

In the construction of such towers it is necessary to employ material which will not be deleteriously affected by the acid or other substance passing therethrough and which will be capable of withstanding the heat to which it may be subjected and it is also desirable that the acid or the like should pass through the tower in a zigzag or sinuous path in counter-current direction to that taken by the flue gases or other medium to the action of which the acid is to be exposed.

In order to meet these requirements it has been hitherto necessary in such structures to employ expensive material (such as volvic stone) which can be obtained in large slabs so that each shelf or partition over which the acid or the like passes may be formed from a single slab.

The object of the present invention is to enable cheaper and more easily procurable materials to be employed in the construction of towers of the above character and for this purpose the invention consists in a tower structure in which the baffles, shelves, partitions or the like are each formed from a number of acid-resisting and heat-resisting bricks arranged to be supported against collapse.

In one modification in accordance with the invention the partitions or the like are formed as arches or half-arches while in another modification in accordance with the invention they may be formed so as not to be self-supporting, in which case they may be supported in part by a wall or partition passing up through the centre of the tower.

In carrying our invention into effect in one convenient manner as, for example, in its application to a tower for the con-

centration of sulphuric acid with the aid of flue gases we form our improved tower of any suitable size and shape having at its upper end an inlet for the acid and an offtake to the condenser and having at its lower part a horizontally extended final concentration chamber at the end of which is a convenient inlet for flue gases so that while the acid enters the tower at the top and flows downwards the flue gases enter at the lower part and flow in an upward direction.

In order to extend as much as possible the length of time for which the acid in passing through the tower is subjected to the action of the flue gases we arrange as is usual for the acid to pass through the tower in a sinuous or zigzag direction and this we effect by the provision within the tower of a number of transverse baffles, shelves or partitions. Instead, however, of making each of these from a single slab we form each of our shelves, baffles or partitions from a number of suitable acid-resisting and heat-resisting bricks and construct them in such a manner that they shall be adequately supported against collapse.

We find, for example, that any of the bricks known in commerce under the names "Staffordshire Blue" "Obsidianite" and "Nori" are suitable for our purpose but it will be understood that the invention is not to be confined to these which are given by way of example only.

In one construction in accordance with the invention we may form our partitions alternately as arch-like structures and as half arches, the arch structures being entirely supported by the sides of the tower owing to their arch construction while the half arches may be supported in part by the sides of the tower and in part by the next lower arch structure. Thus we have a series of convex and (in effect) concave surfaces over which the acid or the like passes, the direction of flow being from the centre to the outside in the case of the arches and from the outside to the centre in the case of the half arches, it being understood that suitable outlet openings are provided for the passage of the acid from one baffle to the next, and

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there being if desired a number of single bricks arranged upon the surface of each of the arches so as to break up the flow of the liquid from the centre to the outside of said surface and give the same a zigzag or staggered tendency.

Where necessary or desirable the tower may be encircled by strengthening bands (more particularly adjacent to the ends of the arch structures) and suitable openings for inspection and cleaning of the arches may be arranged in convenient positions in the tower, it being understood that the tower wall will also be formed from similar bricks to those used in the partition structures while in all cases such bricks must be bonded by means of a suitable acid-resisting and heat-resisting cement or other jointing material, such for example as a mixture of ground glass, silicate of soda and pumice powder with a suitable proportion of water.

In some cases the partitions or the like may be formed plain or in any other suit-

able manner and may be supported in part by the tower wall and in part by a central retaining wall built up through the middle of the tower.

The invention is not to be confined to the particular application hereinbefore given by way of illustration and we may modify the form and size of the tower and the material of the bricks from which the various parts are constructed depending upon any particular practical requirements that may have to be fulfilled.

Moreover in any modification of the invention in which there may be required bridge members in the final concentration chamber these may also be formed of the same acid-resisting and heat-resisting material from which the bricks herein referred to are formed and may be suitably supported upon brick pedestals of the same material.

Dated this 3rd day of July, 1928.

MARKS & CLERK.

COMPLETE SPECIFICATION.

Improvements in Acid-concentrating and like Towers.

We, PHILIP HOWARD EVANS, Lieutenant-Colonel, R.A., British subject, and RICHARD CHARLES BOWDEN, Ph.D., M.Sc., F.I.C., British subject, both of Royal Gunpowder Factory, Waltham Abbey, Essex, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to towers with particular reference to such as are employed for concentrating sulphuric acid and for like purposes.

In all such towers it is usual to provide baffles of some kind within the tower by means of which a zigzag or sinuous path may be given to the materials passing through the tower.

In some cases the baffles are formed by means of packing built up within the tower and forming no part of the structure of the tower, the packings being superimposed one upon the other so that successive layers or tiers of packing are supported by all the layers beneath. In the case of some of such packed towers it has been proposed to employ bricks or blocks which may be built into position to form baffles within the tower and in some cases the blocks have been in part supported by the lining of the tower itself, but even in these cases each tier or layer of packing assists in the support of all the layers or

tiers superimposed thereon.

In addition to the packed towers it is also known to employ towers in which there are baffles or partitions extending across the interior of the tower and forming an integral part of the structure of the tower in the sense that the tower-structure is necessary for the support of such baffles, shelves or partitions. It is to this latter class of tower that the present invention relates, and the object of the invention is to obviate the necessity for the employment of the relatively expensive material obtainable in large slabs which has hitherto been considered necessary for the construction of such towers so that each shelf or the like may be formed from a single slab.

The invention consists in a tower structure of the kind last above referred to in which the baffles, shelves, partitions or the like are each formed from a number of acid-resisting and heat-resisting bricks arranged to be supported against collapse.

In one form in accordance with the invention the partitions or the like are formed as arches or half-arches.

In the accompanying drawings:

Figure 1 illustrates in more or less diagrammatic sectional elevation one form of tower in accordance with the invention, and

Figure 2 is a plan of the upper part of the tower with a part removed.

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In carrying our invention into effect in one convenient manner as, for example, in its application to a tower for the concentration of sulphuric acid with the aid of flue gases and as illustrated in the drawings, we form our improved tower *a* of any suitable size and shape having at its upper end an inlet *b* for the acid and an offtake *c* to the condenser (not shown) and having at its lower part a horizontally extended final concentration chamber *d* at the end of which is a convenient inlet *e* for flue gases so that while the acid enters the tower at the top and flows downwards the flue gases enter at the lower part and flow in an upward direction.

In order to extend as much as possible the length of time for which the acid in passing through the tower is subjected to the action of the flue gases we arrange as is usual for the acid to pass through the tower in a sinuous or zigzag direction and this we effect by the provision within the tower of a number of transverse baffles, shelves or partitions. Instead, however, of making each of these from a single slab we form each of our shelves, baffles or partitions from a number of suitable acid-resisting and heat-resisting bricks as shown in the case of the two lowermost baffles in the drawing and construct them in such a manner that they shall be adequately supported by the tower or lining against collapse.

We find, for example, that any of the bricks known in commerce under the names "Staffordshire Blue" and "Obsidianite" and under the registered Trade Mark "Nori" are suitable for our purpose but it will be understood that the invention is not to be confined to these which are given by way of example only.

In the construction illustrated we form our partitions alternately as arch-like structures *f* and as half arches *g*, the arch structures being entirely supported by the sides of the tower owing to their arch construction while the half arches may be supported in part by the sides of the tower and in part by the next lower arch structure. Thus we have a series of convex and (in effect) concave surfaces over which the acid or the like passes, the direction of flow being from the centre to the outside in the case of the arches *f* and from the outside to the centre in the case of the half arches *g*, it being understood that suitable outlet openings such as *h* (Figure 2) are provided for the passage of the acid from one baffle to the next, and there being if desired a number of single bricks *i* arranged upon the surface of each of the arches so as to break up the flow of the liquid from the centre to the outside of said surface and give the same a zig-

zag or staggered tendency.

Where necessary or desirable the tower may be encircled by strengthening bands *k* (more particularly adjacent to the ends of the arch structures) and suitable openings for inspection and cleaning of the arches may be arranged in convenient positions in the tower, it being understood that the tower wall will also be formed from similar bricks to those used in the partition structures while in all cases such bricks must be bonded by means of a suitable acid-resisting and heat-resisting cement or other jointing material, such for example as a mixture of ground glass, silicate of soda and pumice powder with a suitable proportion of water.

Specifically the cement may advantageously be formed from 1 part water, 8 parts silicate, 8 parts pumice powder and 24 parts ground glass and if a moderate heat be allowed to play on the cement after application it will be found to bake hard and give a firm bonding.

The invention is not to be confined to the particular application hereinbefore given by way of illustration and we may modify the form and size of the tower and the material of the bricks from which the various parts are constructed depending upon any particular practical requirements that may have to be fulfilled.

Moreover in any modification of the invention in which there may be required bridge members such as *l* (Figure 1) in the final concentration chamber *d* these may also be formed of the same acid-resisting and heat-resisting material from which the bricks herein referred to are formed and may be suitably supported upon brick pedestals *m* of the same material.

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

(1) A tower structure of the kind referred to in which the baffles, shelves, partitions or the like are each formed from a number of acid-resisting and heat-resisting bricks arranged to be supported against collapse.

(2) A tower structure according to claim 1 in which the baffles or the like are formed as arches and half arches.

(3) A tower structure according to claim 1 having a final concentration chamber (with, if necessary, bridge members and supporting pedestals) formed similarly to the bricks of the baffles or the like and tower structure.

(4) A tower structure according to the preceding claims in which the bricks are bonded by a cement comprising ground

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glass, silicate of soda and pumice powder mixed with water or other suitable liquid.

(5) The improved tower structures, substantially as described and as illustrated by the accompanying drawings.

Dated this 2nd day of April, 1929.

MARKS & CLERK.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1929.

positions in the tower, it being understood that the tower wall will also be formed from similar bricks to those used in the partition structures while in all cases such bricks may be bonded by means of a suitable acid-resisting and heat-resisting cement or other jointing material, such as for example as a mixture of ground glass, silicate of soda and pumice powder with a suitable proportion of water.

Specifically the cement may advantageously be formed from 1 part water, 8 parts silicate, 8 parts pumice powder and 24 parts ground glass and if a moderate heat be allowed to play on the cement after application it will be found to harden and give a fine bonding.

The invention is not to be confined to the particular application herebefore given by way of illustration and we may modify the form and size of the tower and the material of the bricks from which the various parts are constructed depending upon any particular practical requirements that may have to be fulfilled.

Moreover in any modification of the invention in which there may be required bridge members such as A (Figure 1) in the final concentration chamber, which may also be formed of the same acid-resisting and heat-resisting material from which the bricks forming the tower are formed and may be suitably supported upon brick pedestals of the same material.

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

(1) A tower structure of the kind referred to in which the baffles, shelves, partitions or the like are each formed from a number of acid-resisting and heat-resisting bricks arranged to be supported against collapse.

(2) A tower structure according to claim 1 in which the baffles of the like are formed by arches and half arches.

(3) A tower structure according to claim 1 having a final concentration chamber (with if necessary, bridge members and supporting pedestals) formed similarly to the bricks of the baffles of the like and tower structure.

(4) A tower structure according to the preceding claims in which the bricks are bonded by a cement composition composed

of said surface and give the same a suitable length of time for which the acid is passing through the tower is subjected to the action of the fine gases we arrange as is usual for the acid to pass through the tower in a series of stages, direction and this we effect by the provision within the tower of a number of transverse baffles, shelves or partitions. Instead however of making each of these from a single slab we form each of our shelves, baffles or partitions from a number of similar acid-resisting and heat-resisting bricks as shown in the case of the two lowermost baffles in the drawing and construct them in such a manner that they shall be adequately supported by the tower or being against collapse.

We find for example that any of the bricks known in commerce under the name of "Staffordshire Blue" and "Ophidianite" and under the registered Trade Mark "Zon" are suitable for our purpose but it will be understood that the invention is not to be confined to those which are given by way of example only.

In the construction illustrated we form our partitions alternately as in a-b-c-d-structures A and a half arches y, the arch structures being suitably supported by the sides of the tower owing to their arch construction while the half arches may be supported in part by the sides of the tower and in part by the next lower arch structure. Thus we have a series of convex and (in effect) concave surfaces over which the acid or the like passes, the direction of flow being from the centre to the outside in the case of the arches A and from the outside to the centre in the case of the half arches y, it being understood that suitable outlet openings such as A' (Figure 2) are provided for the passage of the acid from one baffle to the next, and there being if desired a number of single bricks arranged upon the surface of each of the arches so as to break up the flow of the liquid from the centre to the outside of said surface and give the same a

[This Drawing is a reproduction of the Original on a reduced scale.]

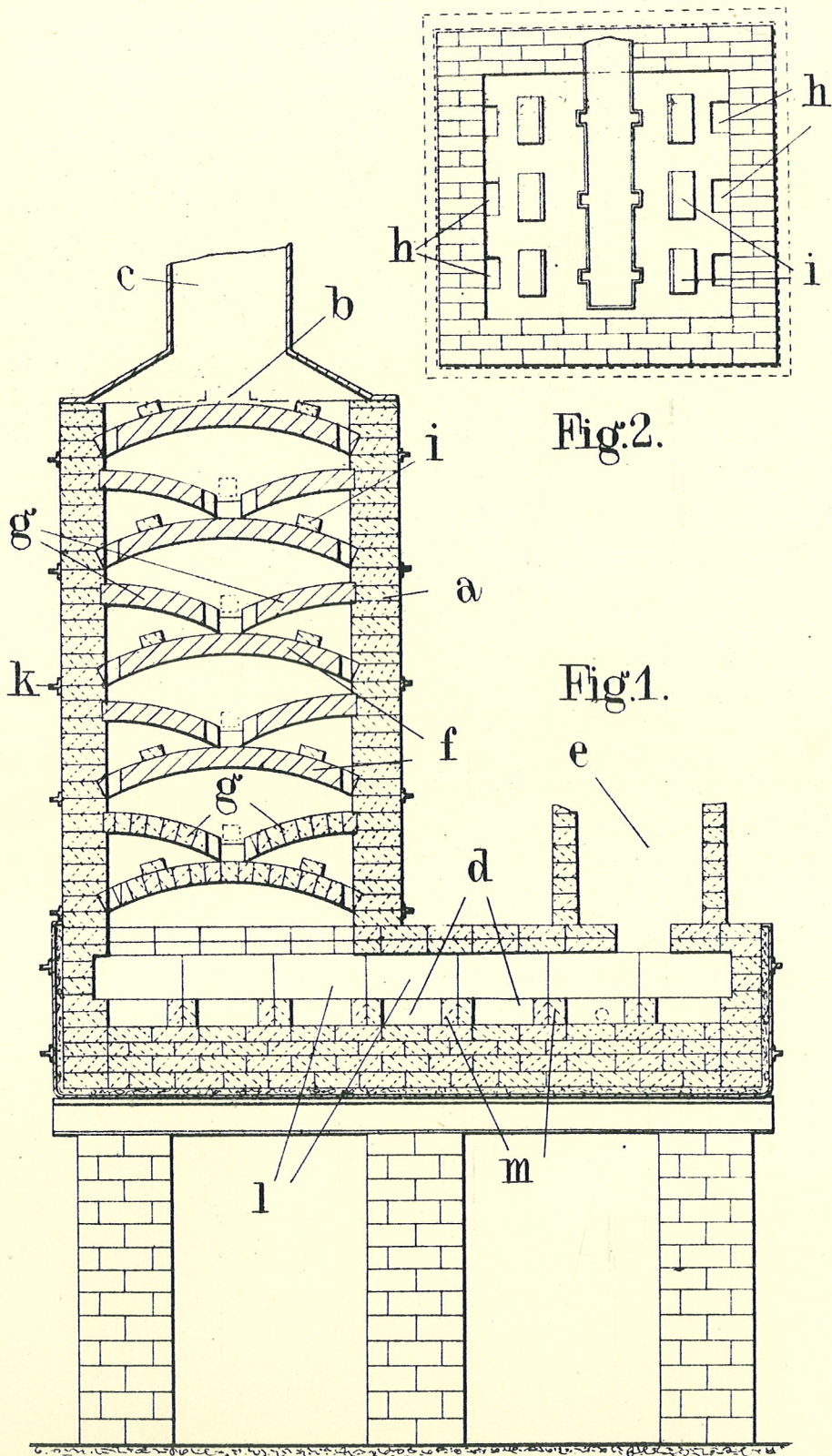


Fig. 2.

Fig. 1.