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RETORT ARCH CONSTRUCTION

Original Filed April 7, 1923

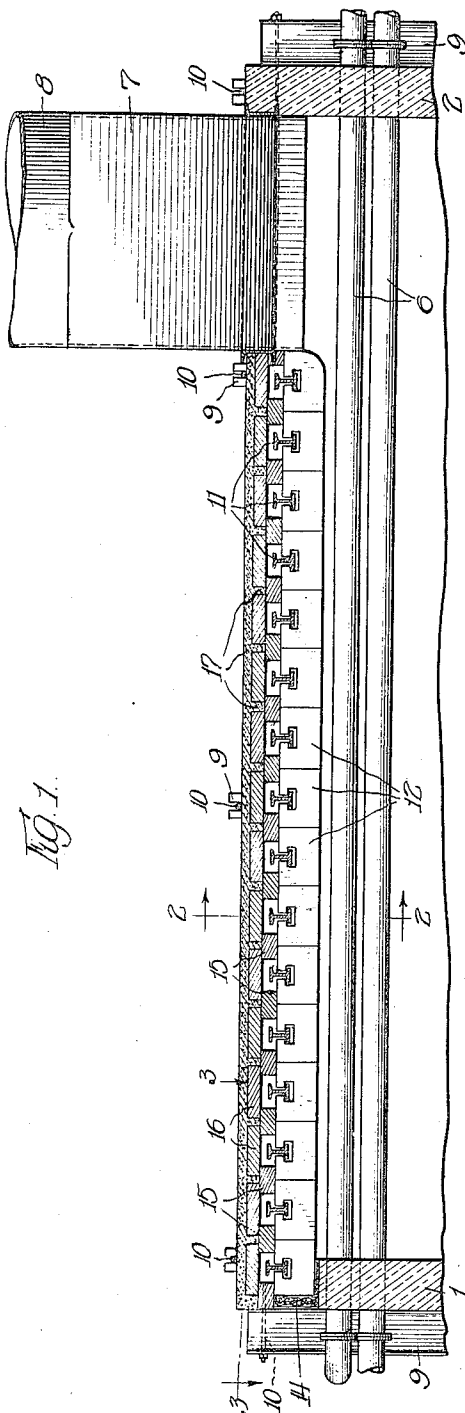


Fig. 1.

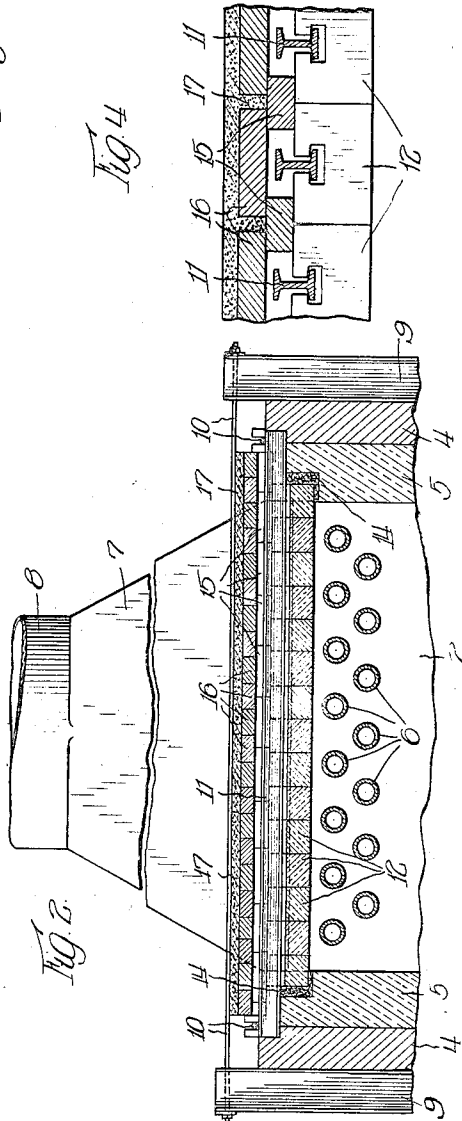


Fig. 2.

Fig. 3.

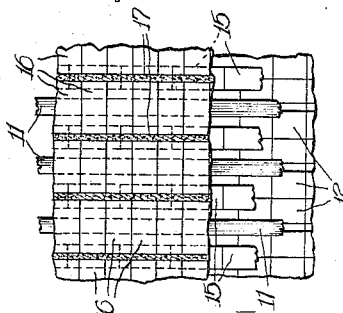


Fig. 4.

Witness:
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By

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UNITED STATES PATENT OFFICE.

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RETORT-ARCH CONSTRUCTION.

Application filed April 7, 1923, Serial No. 630,533. Renewed October 15, 1924.

To all whom it may concern:

Be it known that I, LOUIS H. HOSBEIN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Retort-Arch Construction, of which the following is a specification.

This invention relates generally to furnaces and the like, and pertains particularly to improvements in the construction of retort furnaces of the type employed in the distillation and dehydration of petroleum.

The general purpose of the invention is the provision of a suitable heat resisting flat roof or cover arch which may be supported upon the walls of the retort and which may be suitably insulated to minimize radiation from the retort while affording the necessary radiation from metallic supporting members in the arch structure to permit the requisite cooling thereof.

A further object is the provision of a construction of the sort described which admits of repair and replacement of parts with facility, and in which the refractories are supported in such fashion as to admit of relative movement incident to expansion and contraction by heat, yet are afforded such support as to prevent falling of portions of refractories which may become broken along lines on which fracture is most likely to occur.

Other and further objects of invention will be pointed out hereinafter, indicated in the appended claims, or will be obvious to one skilled in the art, upon an understanding of the present disclosure.

For the purpose of this application there is shown herein one form in which the invention may be embodied, but it is to be understood that the construction is susceptible of wide variation without departure from the essential characteristics of the invention, and that, therefore, the illustrative disclosure herein contained is not to be accorded the effect of limiting the invention which I purport to secure, short of its true and most comprehensive scope in the art.

In the drawing forming part of this specification,

Figure 1 is a longitudinal part sectional

elevation through the top portion of a retort construction embodying my invention;

Figure 2 is a part transverse sectional elevation on substantially line 2—2 of Figure 1;

Figure 3 is detail in the nature of a fragmentary cross section on substantially line 3—3 of Figure 1; and

Figure 4 is a detail in the nature of an enlarged section through the arch corresponding to the section on which Figure 1 is taken.

As is known in the art, it has been customary to employ in the refining of petroleum, stills or retorts consisting of a suitable housing containing banks of pipes through which the petroleum is pumped, and below which the housing affords a fire box in which heat is generated for application to the pipes and the petroleum therein. Such retorts are employed customarily in continuous refining processes for giving petroleum the preliminary heating and accomplishing the dehydration. It is for such an installation that the present invention is primarily designed, and its nature will be understood by reference to the accompanying drawing in which it is shown embodied in a retort of this description.

In said drawing, let it be understood that the numeral 1 designates the front wall of the retort, the numeral 2 the rear wall, the numerals 4 the outer side walls and the numeral 5 the inner or refractory side walls. The latter, of course, are made of fire brick while the outer walls 4 may be formed of ordinary brick. The relationship of the walls is such as to form a chamber in the lower portion of which is provided a fire box or combustion space, in the manner well known. Above said fire box a plurality of retort pipes 6 are arranged to extend horizontally and longitudinally of the retort chamber, said pipes being connected at their ends to constitute a continuous coil through which the petroleum may be pumped. These pipes are arranged in a plurality of stages, and baffles usually are inserted at desired points, in accordance with customary practice, for the purpose of inducing a prolonged tortuous circulation of combustion products among the retort pipes. At the upper rear extremity of the retort is

the stack opening in which is fitted the breeching 7 of the stack 8, said breeching customarily being made of sheet metal. The walls are braced by buck stays 9 which are drawn up by tie rods 10.

The top or cover arch which constitutes my invention includes a plurality of transversely extending I-beams 11 which bridge the retort chamber and are supported at their end portions on the side walls. Upon these I-beams are pendulously suspended the refractory roof tile 12 which, excepting for the rearmost tier, are of rectangular form and are slotted to afford shoulder portions which engage over the lower flanges of the I-beams to retain the tile thereon. Being thus supported with their side faces in contact, the tile afford a continuous flat roof closure for the retort chamber. The marginal tiles overlap the inner wall portions of the retort, the latter being formed with space to accommodate them, and the joints between the walls and the roof tile are filled by compressible heat resisting material 14, such as asbestos packing, to constitute an expansion joint. In assembling the roof, the tile are strung on to the I-beams while the latter are suspended in horizontal position from a derrick and each unit thus assembled is swung into position on the retort walls. The height of the I-beams is such that a substantial portion of the web and all of the upper flanges extend clear of the supported tile, as may be clearly seen in Figure 4. The tile upon the I-beam nearest the stack opening have their lower rear corners rounded off in the form illustrated in Figure 1, and the relationship of that I-beam to the stack breeching 7 is such that the latter extends well down on the rear face of the tile and contacts therewith, for a purpose presently described. With all of the I-beams and their suspended tile assembled in the manner just described, it will be observed that a continuous horizontal refractory closure arch is provided as a cover for the retort chamber. This arch lies in close relationship to the upper bank of pipes and maintains uniform spacing with respect thereto. The arch is completed by an insulating and ventilating covering. This is made up of transverse series of brick 15 which are laid end to end upon juxtaposed tile in covering relationship to the joint therebetween, wherefore said rows of brick extend parallel to the I-beams and at equidistant spacing with respect thereto. The thickness of the brick 15, which I will call the spacing brick, is such that their top surfaces will be higher than the tops of the I-beams 11. Upon these rows of spacing brick 15 are laid cover brick 16, in such relationship that they bridge the space between adjacent rows of the spacing brick, and extend across the I-beams. These cover

brick 16 are laid side by side so as to afford a continuous closure, but spaces are left at the ends of the brick between the adjacent rows. A covering of insulating material is then applied entirely over the cover bricks and in the space therebetween. This covering 17 may be applied in the form of a plastic cement which becomes rigid upon setting. It has the effect of completely closing all joints between the cover brick and maintaining them spaced in the proper relationship for support upon the spacing brick. The spaces or channels about the upper portions of the I-beams 11, however, remain open from end to end and at their ends to afford limited circulation channels over the I-beams.

It is to be observed that the entire arch, including the insulating cover, is supported on the I-beams. Inasmuch as the spacing brick 15 are supported directly on the tile, they accommodate themselves to the movement of the tile incident to expansion and contraction, and thus maintain the desirable close contact requisite to close the joints between the juxtaposed rows of tile. The I-beams, being entirely free of restraint from the insulating covering, will not be cramped or strained through any difference in expansion between the latter and the tile. While the insulating cover is effective to seal the greater proportion of the joints between the tile and to exercise effectively its insulating effect in preventing radiation of heat from the tile, the construction affords a requisite free circulation space about the I-beams permitting escape of any gases which leak through the tile and accommodating the radiation from the I-beams necessary to avoid their destruction by heat. The tile afford one another a mutual support which tends to hold the arch intact even in the event of radical fracture of the tile. The most likely line of fracture of the tile is downwardly from the bottom of the medial slots, but in spite of the fracture of time in such fashion, the portions will be retained in the structure by the cooperation of the associated tile and the I-beams. The tile on the I-beam nearest the stack opening are supported in similar fashion by the breeching 7, which, as pointed out above, contacts the adjacent faces of these tile throughout a substantial portion of their height. Consequently, in the event of the fracture of the tile on this I-beam, the parts will be retained in the relationship in the arch necessary to maintain its integrity. This obviates the necessity for an additional support for the rear end of the cover.

In the operation of retorts of this description it is not desirable to force the fire to the point of obtaining an extremely high temperature, as such would be detrimental to the banks of pipes nearest the

fire box. However it is desirable that there be maintained as nearly uniform temperature on all the pipes as is possible. From these two considerations results the importance of minimizing loss of heat from the retort chamber. The provision of a flat roof arch is highly instrumental to that end, as it tends to maintain uniform distribution of combustion gases throughout the width of the chamber, and to equalize reflection from the roof arch on the retort pipes throughout the length and width of the chamber. Due to the free suspension of the refractory tile, the unobstructed ventilation of the metallic support members, and the freedom of both with respect to the insulating cover, an arch of this construction possesses a long term of utility. In the event of deterioration at any one point, the particular section affected may be removed and replaced independently of other portions of the structure, and without requiring their dismantling. Inasmuch as the load of the arch is carried by the walls on vertical lines, and expansion of the arch is accommodated independently of the walls, it does not have the undesirable tendency to spread or spring the walls. This is of particular importance in an installation of the sort mentioned wherein the retort pipes are mounted in the walls, as a deflection of the walls might have a tendency toward springing the pipes and opening the joints therein. Because of the inflammable nature of the liquid circulated through the pipes, and because of the fact that it is circulated under pressure which is substantially increased by the heat to which it is subjected, it will be appreciated that the straining or opening of leaks in the pipes may be attended with most serious consequences.

I claim:

1. In furnace construction, a combination comprising supporting walls, beams supported thereon, tile suspended from the beams in association to form a top arch between the walls and an insulating cover supported on the tile and covering them and the beams, said cover affording ventilating channels about the beams.

2. In furnace arch construction, a combination comprising supporting beams, tile suspended thereon in association to form a heat resisting top closure, brick supported on the tile over the joints therebetween, an insulating cover supported on said brick and overlying the tile and supporting beams, said brick and cover being spaced from the beams to afford ventilating channels along the same.

3. In structure of the class described, a combination comprising supporting beams, tile suspended thereon in association to form a continuous refractory arch portion, and an insulating cover supported on the tile between the beams and covering the latter and the tile, said cover having channels to permit circulation of air along the beams.

4. In structure of the class described, a combination comprising supporting walls, beams supported thereon, tile suspended thereon in association to form a flexible continuous refractory roof arch, brick covering the joints between tile on juxtaposed beams, and an insulating cover supported on said brick clear of the tile.

5. In fire arch structure, a combination comprising supporting beams, tile suspended from said beams in association to form a continuous refractory arch portion, the upper portions of said beams extending clear of the tile, and an insulating cover supported in covering relationship to the tile and beams, said cover being spaced away from the portions of the beams above the tile and having portions interposed between adjacent beams.

6. In refractory arch structure, a combination comprising supporting beams, tile suspended thereon in association to form a continuous refractory arch portion below the beams, said beams having heat radiating portions extending clear of the tile above the same, spacing brick supported on the tile between the beams, cover brick supported on the spacing brick and housing the beams, and insulating material covering the cover brick.

7. In furnace construction, a combination comprising a beam extending adjacent the stack opening, tile suspended on said beam along the stack opening, cover portion supported by the tile and a plate contacting the faces of said tile along the stack opening to prevent disengagement of portions of said tile from the beam.

8. In furnace construction, a combination comprising a beam extending along an outlet from the furnace chamber, tile having shoulder portions engaging over parts of said beam to retain the tile in suspension on the beam, a cover portion supported by the tile and a plate engaging the terminal faces of the tile to prevent disengagement of their shoulder portions from the beam.

In testimony whereof I have hereunto subscribed my name.

LOUIS H. HOSBEIN.