This invention relates to improvements in locomotive boiler fireboxes and it consists of the matters hereinafter described and more particularly pointed out in the appended claims.

The invention is more especially concerned with fireboxes of the kind equipped with so-called "siphons" having an inlet neck which opens laterally through the lower front section of the adjacent side sheet. A firebox of this kind is illustrated and described in United States Letters Patent No. 1,821,527 granted to Edward J. Reardon on September 1, 1931.

In fireboxes of the kind described, it is difficult because of the lateral inlet neck of the siphons in the firebox, to provide a fire arch therein which does not have openings permitting the passage of gases therethrough.

One of the objects of the present invention is to provide in such a firebox a fire arch that is so constructed as to prevent the passage of gases therethrough to such an extent as to interfere with proper combustion under the arch.

Another object of the invention is to provide an arch for a firebox of this kind wherein certain of the brick thereof have edge portions formed to engage the curved inlet neck of the siphons for a substantial support thereon in a way providing a tight leakless fit therein.

The above mentioned objects of the invention, as well as others, together with the advantages thereof will more fully appear as the specification proceeds to describe the preferred embodiment thereof.

In the drawing:

Fig. 1 is a longitudinal vertical sectional view through a lateral inlet neck siphon equipped locomotive boiler type firebox embodying one form of the invention.

Fig. 2 is a horizontal sectional view through the firebox shown in Fig. 1 as taken on the line 2-2 thereof.

Fig. 3 is a transverse vertical detail sectional view through a part of the firebox as taken on the line 3-3 of Fig. 2.

Fig. 4 is a longitudinal vertical detail sectional view through a part of the firebox as taken on the line 4-4 of Fig. 2.

Referring now in detail to that embodiment of the invention illustrated in the accompanying drawing, the locomotive boiler firebox therein shown comprises a fire chamber which extends from the back sheet 5 to the flue sheet 6 and from one to the other of the side sheets 7, the top of the firebox being formed by the crown sheet 8. The lower part of the flue sheet is made to form the inside throat sheet 9. The usual flues indicated at 10 are secured at one end to that part of the flue sheet above the throat sheet.

The firebox is enclosed by a top plate 11 and the usual side plates 12 which, together with the outside throat plate 13 and back plate 14 are usually called the "wrapper" of the boiler. The back sheet 5 and back plate 14 are formed to provide a fuel door opening 15.

The sheets and plates mentioned define the side water legs 16 and front and rear water legs 17 and 18 of the boiler which are closed at their bottom ends by the mud rings 19. The sheets of the firebox and the outer or wrapper plates are stayboited together in the usual manner.

Within the firebox is located a pair of laterally spaced hollow elements 20 which function to conduct water from the forward bottom end of the side water legs of the boiler to a space 21 above the crown sheet. These elements are of the type known as the Nicholson thermic siphon.

Each element includes a substantially triangular shaped flat hollow body 22 with an upwardly and rearwardly inclined bulged bottom 23. The sides of said body are stayboited together and form at the top thereof a longitudinally elongated discharge opening that is defined by an outwardly extending flange 24 fixed in an opening in the crown sheet. The bulged bottom portion of each siphon extends forwardly and downwardly beyond the body in the form of a supply tube 25. This tube is bent on a curve 26 of generous radius and extends laterally toward the adjacent side sheet to form an inlet neck 27 that opens through and is fixed in the adjacent side sheet 7 toward its bottom.

In connection with the above mentioned construction, I provide a fire arch in the front end of the firebox which is made of fire bricks, certain ones of which are of peculiar shape. Said fire bricks are arranged as two side sets 28-29, an intermediate set 28 and a front end set 30 as best indicated in Fig. 2.

The bricks in both side sets and in the intermediate set are disposed with their length arranged transversely of the firebox, while the bricks in the front end set are disposed with their length arranged longitudinally of the firebox.

In the present instance, each set of side bricks is shown as seven in number and bearing the numerals 31, 32, 33, 34, 35, 36 and 37, beginning to-
ward the front end of the firebox. The first brick 31 in each side set, beginning at the front end, and each portion consists one side and an end for the brick and this curved portion rests upon the rear side of the inlet neck 21 and a part of the curved portion 26 of the supply tube 25 of the associated syphon. The second brick, 32, in each side set, has a curved end portion 33 for engaging upon another part of the curved portion 26 of the associated syphon and this curvature forms a continuation of the curvature of the curved portion 33 of the front end brick 31. The other five bricks in each set are rectangular and are formed at their inner ends to engage upon the bulged bottom 23 of the associated syphon body for partial support. The outer ends of all the bricks in each side set rest upon lugs 46 (see Fig. 3) on the associated side sheet 1 for support of that end of said bricks. If desired, the bricks 34, 35, 36, 37, and 38 may be restrained by tubed interlocking sections as indicated at 41 in Fig. 3.

The bricks in the intermediate row 29 of bricks are preferably six in number and are so shown and beginning at the front end of this set they bear the numerals 42, 43, 44, 45, 46, and 47. The front end brick in this set or row has reversely curved ends 48—49 to engage upon opposite outside parts of the curved portions 26 of the supply tube 25 of both syphons. The front edge of the brick 42 carries a shoulder 42a (see Fig. 1) which is disposed in a plane below the top surface of the brick. Said shoulder stops at its ends against the outer part of the curved portion 25 of the supply tubes of both syphons. This shoulder is disposed in a plane forwardly of the seam afforded by the meeting side edges of the first two bricks 31 and 32 in the side sets or rows 16—19 as best appears in Fig. 2.

The second brick 43 in the intermediate row has straight ends which are formed to rest upon the bulged portion 23 of both syphons 20. The last four bricks 44, 45, 46, and 47 in this set, are all of the same width but narrower than the brick 42. Each one of said ends to supportingly engage upon the bulged portion of both syphons. It is apparent from the above that all of the bricks in the intermediate set are wholly supported from the bulged portion 23 and the tubular, curved and inlet end portions of both syphons in the firebox.

Regarding the bricks in the front end row or set 30, I find it convenient, in the present instance, to use nine bricks therein. This divides the set into smaller units, which may be readily handled within a confined space such as afforded by the location of the tubular necks of the syphons in the front end of the firebox. The bricks in this set extend longitudinally of the firebox and I divide the same into three center bricks 49, 50, and 51 respectively, two pairs of side bricks 52 and 53 and two bricks 54 and 55, one disposed between two side bricks 52—53 and the center bricks 51 and 49 respectively.

The center bricks 49, 50 and 51 are the longest of the front end set of bricks 30. They are substantially rectangular in plan and rest in supporting engagement at their front ends upon supporting lugs 56 carried by the fire throat sheet. The rear end of each of these bricks is formed as a lip 57 to rest in supporting engagement upon the shoulder 42a of the brick 42. The rear end, outer corners of the bricks 49 and 51 are undercut to engage upon an outer part of the curved portion 26 of the adjacent inlet neck of the syphons.

The end bricks 52 and 53 rest in supporting engagement upon the front throat sheet and the rear ends of said bricks are undercut to rest in supporting engagement upon the inlet neck end 27 of the supply tube of the associated syphon. The intermediate bricks 54—55 each rests at its front end on lugs 59 on the front throat sheet 9 and the rear end is curved as well as undercut to rest for supporting engagement upon said curved portion 26 of the supply tubes of both syphons.

With the center bricks 49—50 and 51 of this set engaged upon the shoulder 42a of the brick 42 of the intermediate set 29, said bricks are supported at their rear ends thereupon and at the same time "take" the sliding end thrust of the brick in said set 29 in a manner keeping them in their intended position.

As is apparent from the above in connection with Fig. 23, an indeed tight arch is provided in a curved neck syphon equipped firebox. Therefore, there are no holes in the arch for the passage of gases therethrough so that no interference is present to proper combustion of the fuel therein.

With the construction described, should any one brick require replacement after a period of use, the entire arch need not be dismantled for such a replacement.

While in describing my invention I have referred in detail to the form, arrangement and construction of the parts involved, the same is to be considered only in the illustrative sense so that I do not wish to be limited thereto except as may be specifically set forth in the appended claims.

I claim as my invention:

1. In combination with a locomotive boiler type of firebox having side, front and crown sheets, a plurality of laterally spaced water steaming and circulating elements in the firebox and each including an upwardly and rearwardly inclined longitudinal portion and a tubular inlet neck portion at one end connected thereto by a curved portion and extending laterally toward and opening through the adjacent side sheet, the other end of said longitudinal portion opening through one of the other sheets of the firebox at an elevation above that of the end of the inlet neck portion, and a fire arch in the front portion of the firebox, and composed of sets of bricks, the bricks in some of said sets extending transversely of the firebox and the bricks in another of said sets extending longitudinally of the firebox, certain of the transversely extending bricks having supporting engagement upon longitudinal portions of said elements and upon the side sheets respectively and other of said transversely extending bricks, together with certain of the longitudinally extending bricks having curved portions for supporting engagement upon the curved portions of said element, at least certain of the longitudinally extending bricks engaging upon the front sheet for partial support thereby and others of said transversely extending bricks being disposed between parts of said elements and having supporting engagement thereon.

2. In combination with a locomotive boiler type of firebox having side, front and crown sheets, a plurality of laterally spaced water steaming and circulating elements in the firebox and each including an upwardly and rearwardly
inclined longitudinal portion and a tubular inlet neck portion at one end connected thereto by a curved portion and extending laterally toward and opening through the adjacent side sheet, the other end of said longitudinal portion opening through one of the other sheets of the firebox at an elevation above that of the end of the inlet neck portion, and a fire arch in the front part of the firebox and composed of side, intermediate and front end sets of bricks, the bricks in the side and intermediate sets extending transversely of the firebox, the bricks in the intermediate set being formed for supporting engagement upon the longitudinal portion of said elements and upon parts of the curved portion thereof, the bricks in the side sets being formed for supporting engagement upon the side sheets of the firebox and upon parts of the longitudinal portion of said elements as well as upon said tubular inlet neck portions and said curved portions, the bricks in the front end set extending longitudinally of the firebox and having supporting engagement at one end upon the front sheet, the bricks in the last mentioned set having supporting engagement at the other end upon said curved portions of said elements and upon one of the brick in the intermediate set.

3. In combination with a locomotive boiler type of firebox having side, front and crown sheets, a pair of laterally spaced substantially rigid water steaming and circulating elements disposed in the firebox and each having an elongated discharge end that opens through the crown sheet and a tubular inlet neck portion that curves downwardly and laterally outward toward the adjacent side sheet to open through the associated corner of the firebox near the bottom thereof, and a fire arch in the front part of the firebox and composed of sets of side, intermediate and front end bricks, the bricks in the intermediate set being wholly supported upon said elements, the bricks in said side sets being supported in part from said side sheet and in part from said elements and the bricks in the front end set being supported in part from said front sheet, in part from said inlet neck portion of said elements and in part from one of the brick in the intermediate set.

4. In combination with a locomotive boiler type of firebox having side, front and crown sheets, a plurality of laterally spaced water steaming and circulating elements in the firebox and each including an upwardly and rearwardly inclined longitudinal portion and a laterally curved inlet neck portion extending from one end thereof toward and opening through the adjacent side sheet, the other end of said longitudinal portion opening through one of the other sheets of the firebox at an elevation above that of the inlet neck portion, and a fire arch in the front part of the firebox composed of bricks arranged as two side sets, an intermediate set and a front end set, the bricks in the intermediate set extending transversely of the firebox and the frontmost brick therein being spaced from the front sheet of the firebox and having curved sides engaging upon the curved portion of said water steaming and circulating elements and those bricks to the rear of the said frontmost brick engaging on the longitudinal portion of said elements, all of the bricks in the side sets having supporting engagement at one side upon the adjacent side sheets of the firebox, the frontmost brick in each side set having a curved edge engaging upon the curved portion of the adjacent element and certain of the bricks in each side set rearwardly of the frontmost brick of the set engaging upon the longitudinal portion of the associated element, all of the bricks in the front end set extending longitudinally of the firebox and engaging at one end upon said front sheet, the central bricks in the front end set engaging upon the frontmost bricks of the intermediate set and the side bricks of said front end set engaging upon the curved portion of the associated element.

5. In combination with a locomotive boiler type of firebox having side, front and crown sheets, a plurality of laterally spaced water steaming and circulating elements in the firebox and each including an upwardly and rearwardly inclined longitudinal portion and a laterally curved inlet neck portion extending from one end thereof toward and opening through the adjacent side sheet, the other end of said longitudinal portion opening through one of the other sheets of the firebox at an elevation above that of the inlet neck portion, and a fire arch in the front part of the firebox composed of bricks arranged as two side sets, an intermediate set and a front end set, the bricks in the intermediate set extending transversely of the firebox and the frontmost brick therein being spaced from the front sheet of the firebox and having curved sides engaging upon the curved portion of said water steaming and circulating elements and those bricks to the rear of the said frontmost brick engaging on the longitudinal portion of said elements, all of the bricks in the side sets having supporting engagement at one side upon the adjacent side sheets of the firebox, the frontmost brick in each side set having a curved edge engaging upon the curved portion of the adjacent element and certain of the bricks in each side set rearwardly of the frontmost brick of the set engaging upon the longitudinal portion of the associated element, all of the bricks in the front end set extending longitudinally of the firebox and engaging at one end upon said front sheet, the central bricks in the front end set being longer than the side bricks in said set and engaging at their ends upon the frontmost brick in the intermediate set, side side bricks of said set engaging at their front ends upon the curved portion of the adjacent elements.