F. F. GAINES.

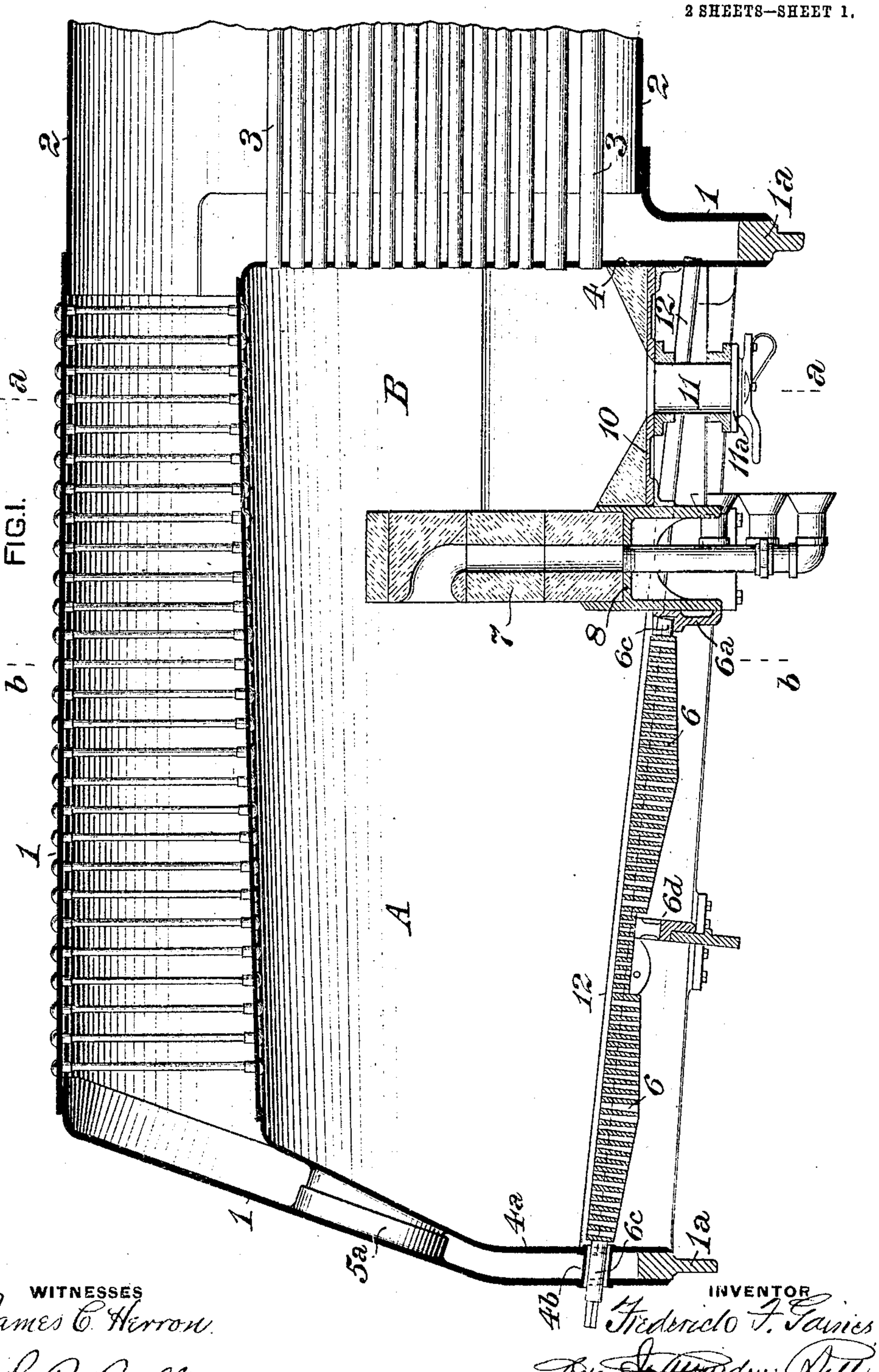
LOCOMOTIVE BOILER FURNACE.

APPLICATION FILED AUG. 28, 1909.

943,823. Patented Dec. 21, 1909.

2 SHEETS—SHEET 1.

FIG. I.



WITNESSES

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2 SHEETS—SHEET 2.

FIG.3.

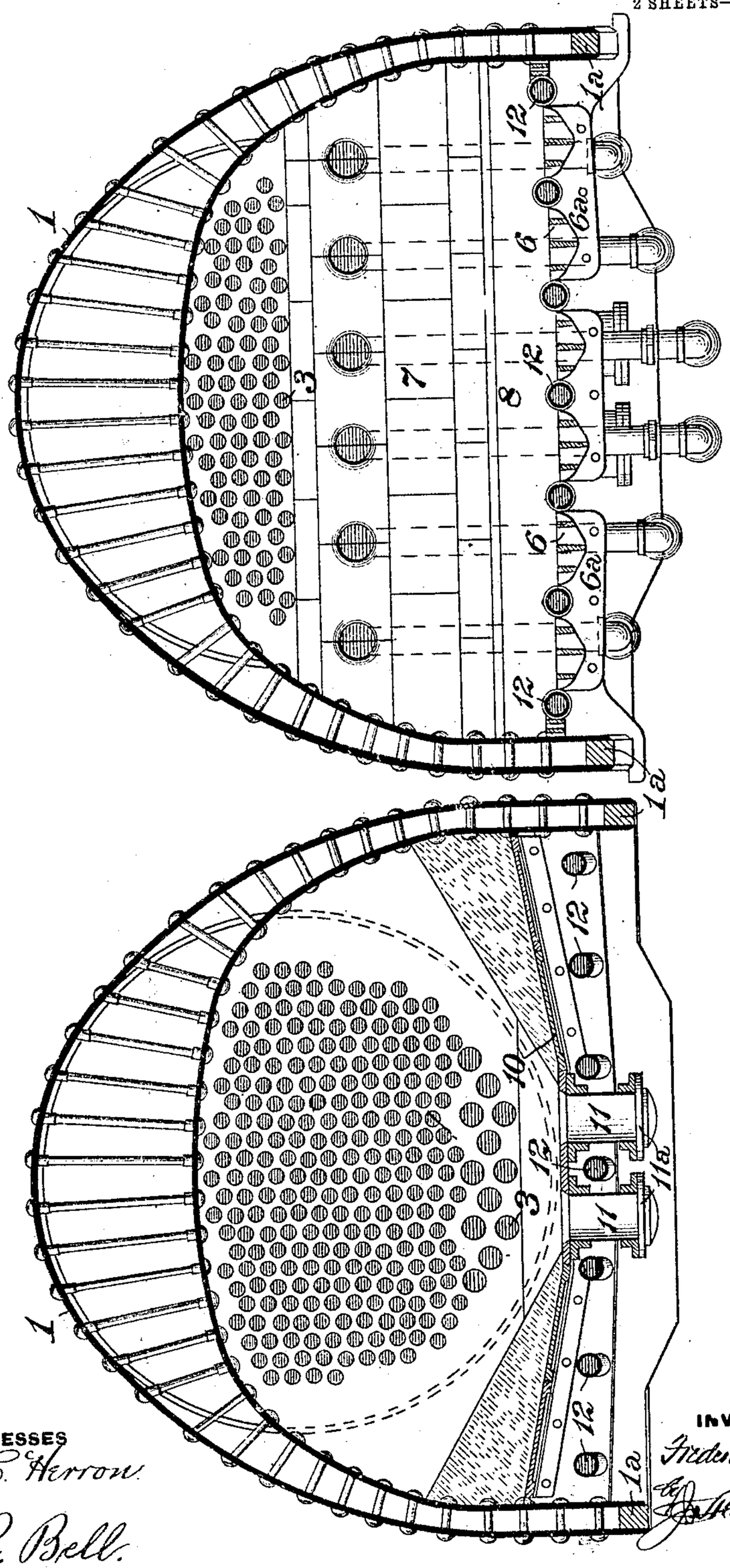

FIG.2.

WITNESSES

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UNITED STATES PATENT OFFICE.

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LOCOMOTIVE-BOILER FURNACE.

943,823. Specification of Letters Patent. **Patented Dec. 21, 1909.**

Application filed August 28, 1909. Serial No. 514,986.

To all whom it may concern:

Be it known that I, FREDERICK F. GAINES, of Savannah, in the county of Chatham and State of Georgia, have invented a certain new and useful Improvement in Locomotive-Boiler Furnaces, of which improvement the following is a specification.

My present invention relates to locomotive boiler furnaces of the type in which the space within the firebox is divided, by a vertical bridge wall, into a rear fire chamber and a forward combustion chamber, an instance of which is exemplified in Letters Patent of the United States No. 934,157, granted and issued to me under date of September 14, 1909.

The object of my invention is to facilitate the free steaming of a locomotive boiler having a furnace of the above type, as well as to increase the life of the grate bars used therein.

The improvement claimed is hereinafter fully set forth.

In the accompanying drawings: Figure 1 is a vertical longitudinal central section through the firebox and the adjoining portion of the waist of a locomotive boiler, illustrating an application of my invention, and; Figs. 2 and 3, vertical transverse sections through the firebox, on the lines *a a* and *b b*, respectively, of Fig. 1.

My invention is herein exemplified as applied in a locomotive boiler of the type shown in Letters Patent No. 934,157 aforesaid, that is to say, having a wide firebox, 1, connected to a waist, 2, through which a plurality of flues, 3, extend from a flue sheet, 4, to a smoke box (not shown) at the forward end of the waist. The rear water wall of the firebox is provided with one or more firing openings, controlled by suitable doors in the usual manner, two of said openings being used in this case, and the flanges, 5ª, around one of them which is out of the longitudinal central plane of section, being shown in Fig. 1. The interior of the firebox is, as in Letters Patent No. 934,157 aforesaid, divided by a vertical bridge wall, 7, of firebrick or other suitable refractory material, supported on a transverse bearer, 8, into a fire chamber, A, extending from the rear side of the bridge wall to the rear of the firebox, and a combustion chamber, B, extending from the front side of the bridge wall to the flue sheet, 4.

In the practice of my present invention, I provide a plurality of grate bars, 6, of any suitable and preferred construction, which extend from the rear water wall of the firebox to the bridge wall, 7, and are supported, at their front ends, on bearers, 6ª, secured to the rear side of the bridge wall bearer, 8. The ends of the grate bars are provided with trunnions, 6ᶜ, which fit in the bearers, 6ª, and pass through sockets or thimbles, 4ᵇ, fixed in the rear water wall of the firebox, a short distance above the mud ring, 1ª, thereof, and the middle portions of the grate bars rest on intermediate bearers, 6ᵈ, fixed to the side portions of the mud ring. The grate bars may be rocked or shaken by bars applied to squared portions on the outer ends of their rear trunnions, in order to clear them of cinders when desired. I also provide a plurality of open ended water grate tubes, 12, which are formed of double extra strong pipe, preferably about 2½ inches in diameter, and are secured, at their front and rear ends, in the flue sheet, 4, and the back sheet, 4ª, of the inside firebox, respectively, said water grate tubes passing through the bearer, 8, of the bridge wall, and under, and entirely clear of, the bottom plate, 10, of the combustion chamber, B. As shown in Fig. 1, both the grate bars, 6, and water grate tubes, 12, are downwardly inclined from the rear to the front of the fire box, and are relatively alternated in position, each grate bar being interposed between two water grate tubes. In the instance shown, one of the water grate tubes is located in the longitudinal central plane of the firebox, and consequently the combustion chamber, B, is provided with two discharge hoppers, 11, each having a movable slide or door, 11ª. It will, however, be obvious that a single discharge hopper will only be necessary if the middle water grate tubes are located on opposite sides of the longitudinal central plane.

I have found in practice that the free steaming qualities of a locomotive boiler of the type to which my invention relates are materially promoted by the use of my improvement. The alternated grate bars and water grate tubes present a grate surface which is suitable for the support of the fuel and the proper admission of air thereto, and which may be readily cleared of cinders by rocking the grate bars. The water grate tubes, the location of which is such as not to reduce or interfere with the combustion chamber space, maintain a constant circula-

tion of water in the boiler, as the colder water naturally tends to pass to the lowest point, which is in the front water wall of the firebox, and as the water therein is heated, it rises and colder water takes its place. The interposition of the grate tubes between the grate bars has the further advantage of increasing the life of the latter by preventing them from rapidly burning out, as they are found to do when forming the entire supporting surface of the fuel in the fire chamber.

I claim as my invention and desire to secure by Letters Patent:

1. The combination, with a locomotive boiler firebox, of a bearer extending across the firebox near the bottom thereof and attached at its ends thereto, a bridge wall of refractory material supported on said bearer and dividing the interior of the firebox into a rear fire chamber space and a forward combustion chamber space, a bar grate extending longitudinally at the bottom of the fire chamber space, and a plurality of water grate tubes, alternated in position with the bars of the grate and extending from the rear to the front water wall of the firebox and below the combustion chamber space.

2. The combination, with a locomotive boiler firebox, of a bearer extending across the firebox near the bottom thereof and attached at its ends thereto, a bridge wall of refractory material supported on said bearer and dividing the interior of the firebox into a rear fire chamber space and a forward combustion chamber space, a plurality of grate bars extending from the bridge wall to the rear wall of the firebox, and a plurality of water grate tubes, alternated in position with the grate bars and extending from the rear to the front water wall of the firebox and below the combustion chamber space.

3. The combination, with a locomotive boiler firebox, of a bearer extending across the firebox near the bottom thereof and attached at its ends thereto, a bridge wall of refractory material supported on said bearer and dividing the interior of the firebox into a rear fire chamber space and a forward combustion chamber space, a plurality of rocking or vibratable grate bars extending from the bridge wall to the rear water wall of the firebox, and a plurality of water grate tubes, alternated in position with the grate bars and extending from the rear to the front water wall of the firebox and below the combustion chamber space.

4. The combination, with a locomotive boiler firebox, of a bearer extending across the firebox near the bottom thereof and attached at its ends thereto, a bridge wall of refractory material supported on said bearer and dividing the interior of the firebox into a rear fire chamber space and a forward combustion chamber space, sockets or thimbles fixed in the rear water wall of the firebox, grate bar bearers fixed to the bridge wall bearer, a plurality of grate bars having end trunnions supported on the grate bearers and in the sockets or thimbles, and a plurality of water grate tubes, alternated in position with the grate bars and extending from the rear to the front water wall of the firebox and below the combustion chamber space.

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Witnesses:
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