No. 846,836. PATENTED MAR. 12, 1907.

H. EMERSON.

BOILER FURNACE.

APPLICATION FILED JULY 5, 1906.

Fig. 1.

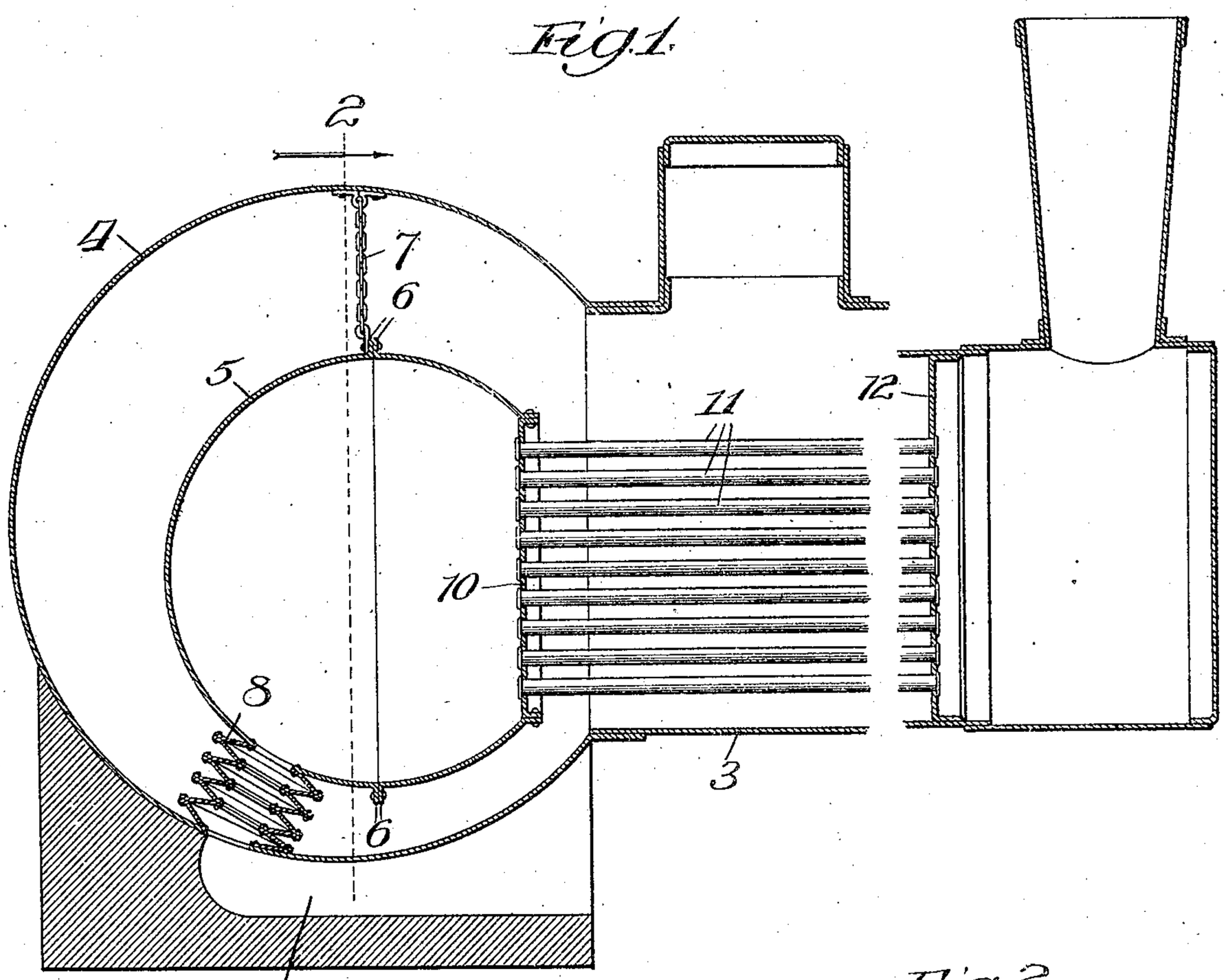
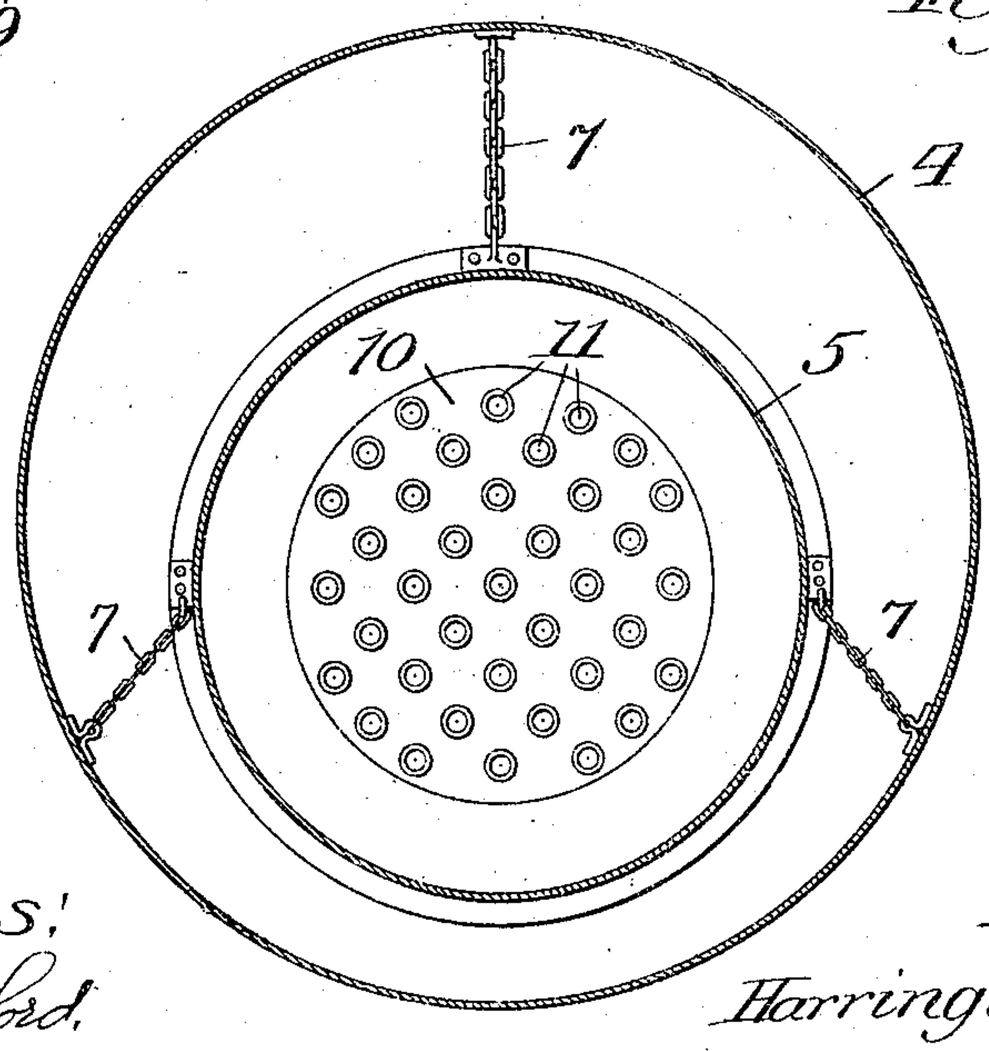


Fig. 2.



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BOILER-FURNACE.

No. 846,836. Specification of Letters Patent. Patented March 12, 1907.

Application filed July 5, 1906. Serial No. 324,763.

To all whom it may concern:

Be it known that I, HARRINGTON EMERSON, a citizen of the United States, residing at Topeka, in the county of Shawnee and State of Kansas, have invented a new and useful Improvement in Boiler-Furnaces, of which the following is a specification.

My invention relates to improvement in boiler-furnaces generally, and more particularly to those of the locomotive type employing liquid or gaseous fuel.

In locomotive construction the fire-box is necessarily limited as to height and width by road and stability requirements, so that the water-spaces over the crown-sheet and at the opposite sides of the fire-box are made as constricted as possible. The fire-box is constructed with a nearly flat crown-sheet and reëntrant curves at the sides merging into straight lines as they approach the mud-ring. On account of the irregularity in shape of the fire-box unequal strains from expansion and contraction have to be provided for, and the fire-box is therefore stayed with numerous bolts connecting it with the boiler-shell. The bolts, as well as the fire-box sheets, are in practice subject to change of temperature, producing expansion and contraction. Expansion of the bolts tends to make the holes through which they pass larger, while expansion of the sheets tends to make the said holes smaller. Thus great heat tends to strain the parts by producing ultra tight joints between the bolts and sheets, while when cooling takes place the bolts contract and the holes grow larger, resulting in leaks. The fire-box flue-sheet is rigidly connected with the boiler-shell and is connected with the smoke-box flue-sheet by a number of boiler-tubes. These tubes expand and contract under changes in temperature, resulting in strain, which not only tends to loosen them in the flue-sheets, but also to strain the fire-box structure and the stay connections between it and the boiler-shell.

My object is to provide a fire-box of improved construction which will cause it to withstand without danger of injury the strain of expansion and contraction in use; and it is further my object to so mount and support the fire-box in the boiler-shell as to avoid the use of stay-bolts or other rigid connections between it and the boiler-shell.

In carrying out my invention in a locomotive oil-burning furnace I provide a fire-box of more or less spheroidal form, suitably suspended or mounted in a boiler-shell end portion, also preferably of more or less spheroidal form, the connecting means between the two being such that the fire-box will "float," so to speak, in the boiler and have limited independent movement to permit of expansion and contraction without affecting the shell of the boiler. The fire-box flue-sheet may be, and preferably is, a flat disk to which the boiler flues or tubes are rigidly secured at one end. The tubes extend at their opposite ends to and are fastened in the stationary smoke-box flue-sheet.

In the accompanying drawing I show, for purposes of illustration, one way of applying my invention.

Figure 1 is a broken longitudinal section of a locomotive boiler and fire-box constructed with my improvements and showing no more than is necessary to give an understanding of my invention, and Fig. 2 a section taken on line 2 in Fig. 1.

The boiler-shell 3 has a rear end portion 4 of the more or less spheroidal shape indicated. 5 is the fire-box, also of more or less spheroidal form, which may be constructed in any manner to give strength. Flanges 6, where they occur, may be at the outer side of the fire-box and immersed in the water held by the boiler. The fire-box is loosely mounted in the boiler-shell portion 4 by means of suspending and stay chains 7, suitably disposed to hold the fire-box securely and with reasonable steadiness in proper position. Extending between openings at the lower sides of the fire-box and boiler-shell is an inlet-flue 8, which may be constructed with bellows-like sides to render it slightly flexible and capable of ready expansion and contraction. The flue 8 communicates at its lower end with a flue 9, which may contain or lead from a hydrocarbon-oil burner or other source of heat-supply, the hot products of combustion from which enter the fire-box 5.

10 is the fire-box flue-sheet, in which are fastened the ends of the tubes 11. The tubes are fastened at their opposite ends in the rigid smoke-box flue-sheet 12

The fire-box being spheroidal, as stated, is of the form possessing maximum resistance to uniform external pressure. It may be spun and seamless or be built up of separate convex plates or segments of any desired number. Any seams would, as shown, be formed with flanges extending outwardly

into the surrounding water-space and would therefore be wholly submerged. As the effect of pressure in the boiler-space is to press the plates and seams together, they need not necessarily be riveted in order to form water-tight joints and could be merely clamped to hold them in place. The flanges act as ribs, reinforcing the fire-box against collapsing pressure, and they may be deepened to any desired extent to contribute strength with comparatively little increase of weight. The plates of which the fire-box is formed may be comparatively thin the better to transmit heat, yet be extraordinarily rigid against collapse from external pressure. The most stable connection is that with the smoke-box sheet 12. Expansion and contraction of the tubes will swing the fire-box back and forth on its flexible sustaining means. The fire-box and boiler-tubes would in practice be sustained, for the most part at least, by the surrounding water, thus producing what may be termed a "floating" fire-box. The tubes 11, owing to their length, would have sufficient flexibility to permit slight lateral movement of the fire-box without affecting the security of their connection with the flue-sheets. Should the tubes expand and contract unequally, it might cause the fire-box to have slight angular movement and some of the tubes to curve slightly; but there would be no material bending strain, as in the case of rigidly-stayed flue-sheets of boiler-furnaces of the usual type. The surrounding water tends to cushion the fire-box against shock; but as the fire-box may have slight independent movement during the travel of the locomotive it will tend to produce more rapid circulation of the water and to dislodge sediment.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a boiler-furnace, the combination with a boiler-shell, of a fire-box movably suspended therein and forming therewith a fire-box-surrounding water-space.

2. In a boiler-furnace, the combination with a boiler-shell, of a fire-box movably suspended therein and having a fuel-inlet leading into it through said shell, said shell and box forming a water-space extending about the latter entirely between opposite sides of said inlet.

3. In a boiler-furnace, a fire-box inclosed in the boiler-shell and nearly surrounded therein by a water-space, said fire-box being movably suspended in the boiler-shell to have limited, independent expansion, contraction and movement therein, a flue-sheet forming one side portion of the fire-box, a flue-sheet secured to the boiler-shell adjacent to the smoke-box and boiler-tubes fastened at opposite ends to said flue-sheets.

4. In a boiler-furnace, a boiler-shell having a spheroidal end portion, a spheroidal fire-box inclosed in said end portion and nearly surrounded therein by a water-space, said fire-box being movably suspended in said end portion to have limited, independent expansion, contraction and movement therein.

5. In a boiler-furnace, a fire-box inclosed in the boiler-shell and nearly surrounded therein by a water-space, and flexible suspending means in the boiler-shell by which the fire-box is hung thereon, for the purpose set forth.

6. In a boiler-furnace, a spheroidal fire-box constructed with externally-ribbed seams and inclosed in the boiler-shell and nearly surrounded therein by a water-space, said ribbed fire-box being movably suspended in the boiler-shell, for the purpose set forth.

7. In a boiler-furnace, a fire-box inclosed in the boiler-shell and nearly surrounded therein by a water-space, said fire-box being loosely supported in the boiler-shell, for the purpose set forth, and a flexible inlet-flue extending through the boiler-shell to the interior of the fire-box.

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