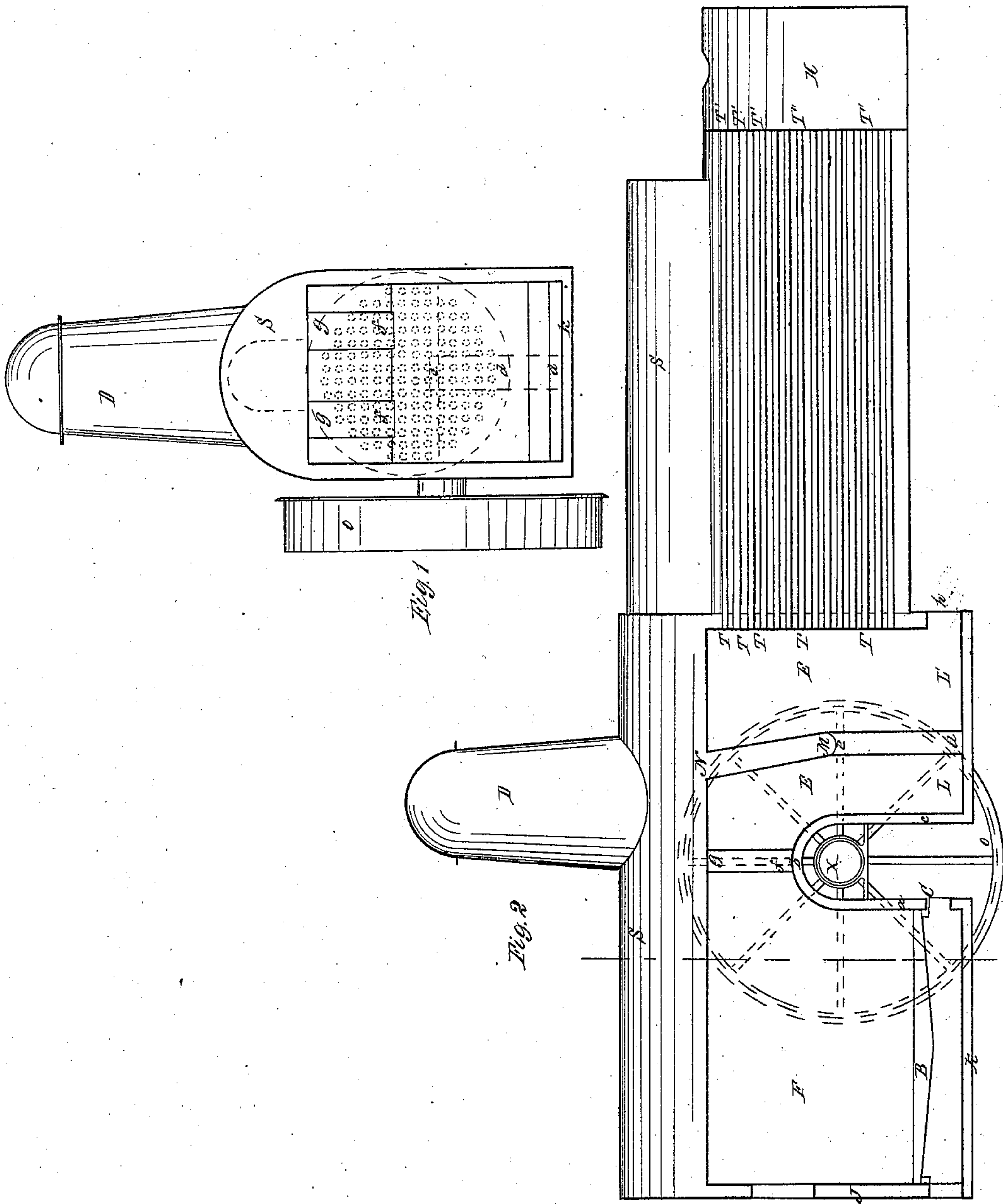


*L. Phleger,*  
*Steam-Boiler Fire-Box.*

*N<sup>o</sup> 14,408.*

*Patented Mar. 11, 1856.*



*Witnesses;*  
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# UNITED STATES PATENT OFFICE.

LEONARD PHLEGER, OF TAMAQUA, PENNSYLVANIA.

## IMPROVEMENT IN STEAM-BOILERS.

Specification forming part of Letters Patent No. 14,408, dated March 11, 1856.

*To all whom it may concern:*

Be it known that I, LEONARD PHLEGER, of Tamaqua, in the State of Pennsylvania, have invented a new and useful Improvement in Locomotive and other Boilers; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, making a part of this specification, in which—

Figure 1 represents a vertical transverse section of a locomotive with my improvement; Fig. 2, a vertical longitudinal section of the same.

In Fig. 2, F represents the furnace; B, the grate-bars; S and S', the steam-chamber; D, the steam-dome. T T' T T', &c., represent the tubes through which the smoke and heat pass. H represents the smoke-chamber. I represents a front water-space; K, a water-bottom; L L', a water table or bottom communicating with the water-bottom K by the arch or concave water-space *a b c*. M N is a water-back extending down from the crown-sheet of the boiler. *d e* is a central tube extending up from the water-table L L' and communicating with the water-back M N. *f g* and *f' g'* are two vertical tubes or passages extending from the top of the arch or concave water-space *a b c* to the crown-sheet of the boiler. X is the axle; O, the front driving-wheel of the locomotive.

The nature of my improvement consists, first, in the construction of locomotive-boilers with a concave or arched water-space, as at *a b c*, under which the axle X of the driving-wheel revolves; secondly, in the removal of the extremities T T' T of the tubes farther from the back of the furnace F than they are ordinarily placed, and in the interposition of a cavity or receptacle, C E, with a water-bottom, L L, to consume the fuel and catch refuse ashes carried by the flame and smoke from the furnace, which would otherwise pass into and through the tubes T T' T T' into the smoke-box, and, burning there, would eventually destroy the smoke-box H, as now takes place in ordinary boilers.

To enable others skilled in the art to make and use my improvement, I proceed to describe its construction and operation in detail.

F, Fig. 2, is the furnace, of about the ordinary length, breadth, and depth of the fur-

nace of a coal-burning locomotive—say, for a twenty-six-ton engine, about five feet two inches long, thirty-nine inches wide, and about four feet from the grate to the crown-sheet of the boiler. In front of the furnace I place the ordinary water-space, I, and a water-bottom, K. At the back of the furnace I place an arched water-space, *a b c*, which begins at the water-bottom K and extends up about thirty inches to the crown *b*, and then passes down and connects with another water table or bottom, L L. This arched water-space is made of two parallel sheets of boiler-iron, and is of the same width as the back of the furnace. An aperture at C is left in this arched water-space in order to apply the blast or blower tube. This arched water-space must be made sufficiently high and left open below, so as to permit the axle X to be placed up and to revolve under it, and so that the boiler may be thus suspended between the drivers and may hang down near to the track. Thus much of the lateral oscillation of the locomotive and consequent wear and tear of the rail is avoided.

For an engine of twenty-six tons I make my arched water-space *a b c* from two to three inches between the plates, and I make the arch itself about sixteen inches across, varying, of course, their dimensions somewhat with the size of the engine. A frame extends outside of the boiler, to which the boxes of the axle are attached. From the crown of the arched water-space at *b* two vertical tubes, *f g* and *f' g'*, of about two inches diameter, extend, which make a communicating passage for the water from the arched water-space up through the crown-sheet of the boiler. By this arrangement the water can circulate from the water-bottom up through the arch to the crown of the furnace. I also extend a water-back, N M, (of from four to six inches thickness and of the whole width of the furnace,) down from the crown-sheet. It extends about one-half the depth of the receptacle E E. This water-space is about fourteen inches from the arched water-space and makes an angle of ninety degrees or one hundred degrees with the crown-sheet, as shown in Fig. 2. A central tube, *d e*, extends from the water-bottom L L' up to the lower extremity of the water-space M N, and thus affords a passage for the water to



circulate from the water-bottom at L L' up to the crown. The ordinary boiler-tubes, T T' T T', are about two feet shorter in my boiler than in most boilers, and there is a space thus left between the water-space *e d* and the opening of the tubes T T T, &c. The water-back N M acts in connection with the arched water-space *a b c*, and reverberates the flame and particles of fuel down against the water bottom or table L L'. The heat and flame afterward rise and pass through the tubes T T' T T'. By this arrangement the intensity of the flame is not thrown against the extremities of the tubes as is ordinarily done, and they are not burned off and destroyed. At the same time a portion of the unconsumed solid particles of fuel will burn on the water-table L L' and the ashes and particles of fuel will be deposited there instead of passing through the tubes T T' T T' and clogging them up, or depositing in the smoke-box H and burning up the smoke-box.

A small door is placed at *h*, so that the solid particles of ashes or fuel thrown down upon the water table or bottom L L' and collecting there can be removed.

The advantages of my improved arrangement of locomotive-boiler are that by the combined action of the arched water-space *a b c*, the water-space M N, and the water-table L L' the flame and particles of fuel and ashes from

the furnace are reverberated down upon the water-table L L', instead of being thrown against the mouth of the tubes T T, &c, the tubes are not so soon destroyed, and they are not so liable to be clogged up, neither is there such an accumulation of burning particles of fuel in the smoke-chamber H. By this arrangement, also, the boiler of the locomotive may be suspended much nearer the ground and the wheels or axle can, when desired, be removed with as great facility as at present. A portion of my improvement may be applied to steamboat or other boilers, if desired.

Having thus described my improvements, what I claim, and desire to secure by Letters Patent, is—

1. The arrangement of the arched water-space *a b c*, so that the boiler may be suspended near to the track, in the manner and for the purposes substantially as hereinbefore described.

2. The arrangement of the arched water-space *a b c*, the water-space N M, and the water-table L L', in combination, so that the flame and heat will be reverberated, in the manner and for the purpose substantially as hereinbefore described.

LEONARD PHLEGER.

Witnesses:

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