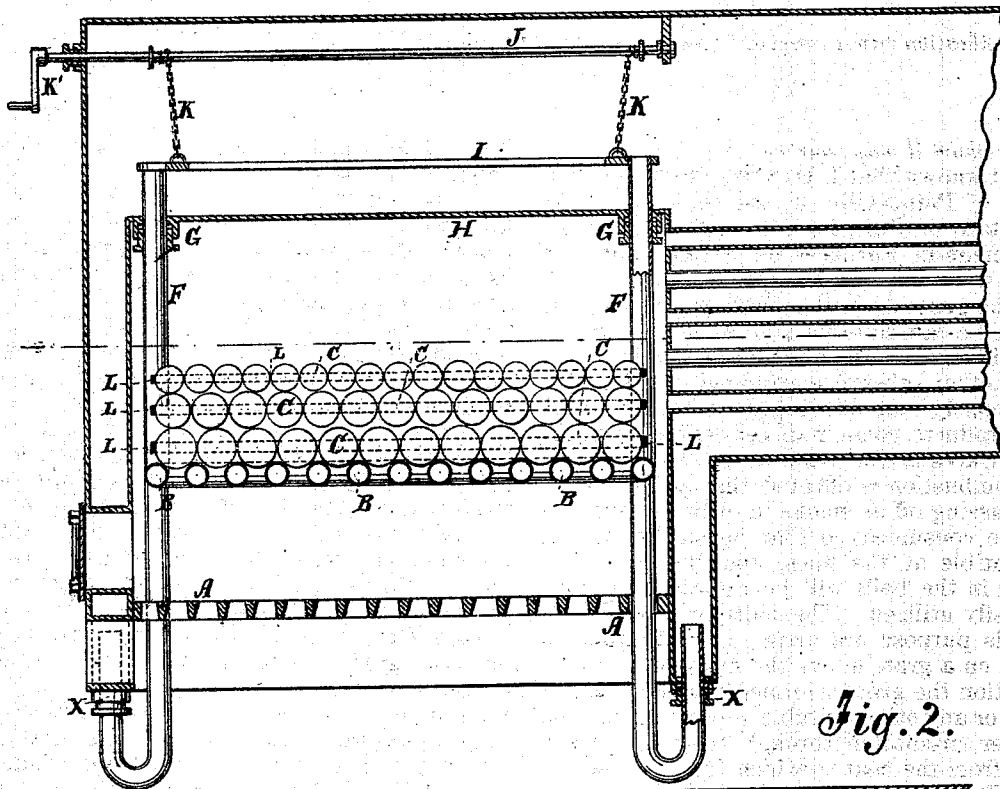


**D. T. CASEMENT.**  
**Furnaces for Steam-Boilers.**

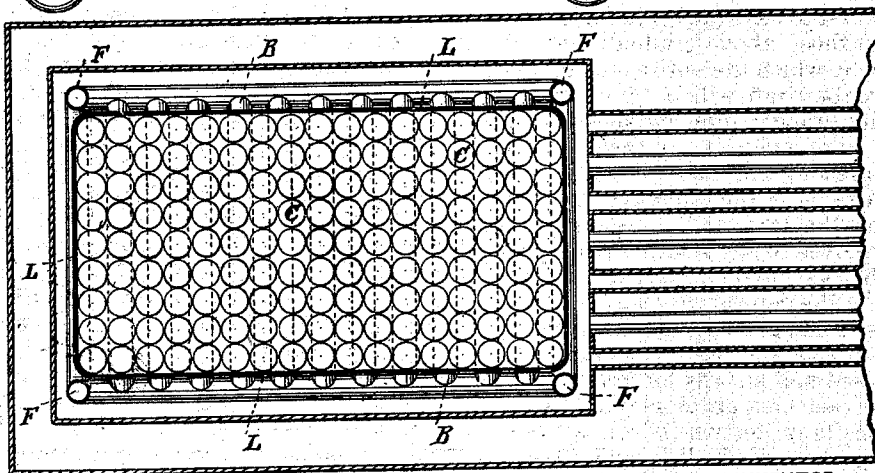
No. 146,653.

Patented Jan. 20, 1874.

*Fig. 1.*



*Fig. 2.*



WITNESSES:

*A. Benneken & Co.*  
*Stilquist*

INVENTOR:

*D. T. Casement*

BY

*Wm. L.*

ATTORNEYS.

# UNITED STATES PATENT OFFICE.

DANIEL T. CASEMENT, OF PAINESVILLE, OHIO.

## IMPROVEMENT IN FURNACES FOR STEAM-BOILERS.

Specification forming part of Letters Patent No. **146,653**, dated January 20, 1874; application filed December 18, 1873.

*To all whom it may concern:*

Be it known that I, DANIEL THOMAS CASEMENT, of Painesville, in the county of Lake and State of Ohio, have invented a new Improvement in Furnaces for Steam-Boilers, of which the following is a specification:

If the gases and other products rising from the fire be caused to pass between and around balls, blocks, or other broken pieces of metal, or any other substance arranged in position to be intensely heated from the fire below, so that said products come in direct contact with the hot surfaces of the balls or blocks, such perfect combustion is effected that all the particles passing off as smoke in ordinary furnaces will be consumed, so that no smoke will be perceptible at the flues, and the heat thus stored in the balls will be radiated, and may be easily utilized. The balls or blocks used for this purpose are arranged in stratum or layers on a grate above the fire-space. In my invention the grate is formed of hollow bars of metal or any other suitable substance, and has a water circulation through them, to protect them from the heat to which they will be subject. It is best to have the lower balls or blocks larger, and those above gradually less in size to the top, by which the entire substances carried up by the draft will be more effectually divided and brought into contact with the hot surfaces. Care must, in any case, be taken to have the area of the mass of balls or blocks and the capacity of the interstices sufficient to not obstruct the draft, and, if necessary, means will be employed to stir about or re-arrange the balls or blocks quickly, in case of need, for cleaning out the deposit that may collect in the interstices. The grate for holding the balls is arranged to rise and fall, principally to allow it to be raised temporarily for feeding the fuel; and in the case of a grate having a water-circulation for its protection its connections with the water-jacket will be by packed telescopic pipe-joints, or any equivalent thereof that will enable it to rise and fall and at the same time maintain the proper connection for the circulation of the water.

To illustrate the application of my invention, I refer to the accompanying drawing, in which—  
Figure 1 represents a sectional elevation, and

Fig. 2 a horizontal section, of the furnace of a boiler of the locomotive type.

In the drawing, A represents the ordinary fire-grate, whereon the fuel to be burned is placed; B, the grate above, for supporting the balls; and C, the balls, of which, in this case, I have represented three tiers superposed, but more or less may be used. Generally they will be made of metal having great power to retain heat, and not fusible at such heat as will be produced by this mode of combustion. Cast or wrought iron, Bessemer steel, or scrap-iron will probably be used. If the fire-space is low, it is more necessary the grate B be made vertically adjustable than if it be high, in order to enable it to be lifted temporarily for supplying fuel, and, when made of ordinary grate-bars, it will be raised and lowered by any simple means, but, when made of tubes for a water circulation, the means suitable for raising the ordinary grate will not do, and the necessary connecting-joints for the water circulation will have to be provided. For these purposes, I have represented the grate as suspended by four tubes, F, extending up through stuffing-boxes G in the crown-sheet, and connected above it by cross-bars I, or any kind of frame, which is suspended from a shaft, J, by chains K, the shaft extending out through the front of the furnace, and having a crank or hand-wheel, K', for turning it, to raise and lower the grate by winding the chains on and off. The suspending-tubes F are open to the water-space at the upper ends—also to the water-space in the tubes of the grate—and afford means for the circulation of the water, as well as for the support and also the adjustment of the grate, by extending downward and into the water-jacket at the stuffing-boxes X.

In case it may be needful to have greater leverage for raising the grate and balls, which in some cases will be very heavy, the chains may wind on a counter-shaft in the water-space, with which the crank-shaft may gear by suitable reducing-gears.

In order to prevent the balls from bearing against the walls of the fire-jacket, confining hoops or bands L, of Bessemer steel, or other metal or substance, protected, if necessary, with asbestos, may be used, as shown in the

drawing, or any other suitable means may be employed to hold the balls away from the walls.

If the draft is obstructed by the balls, the flue may be lengthened, or jets of steam or air may be blown into the fire or the flue.

This plan of consuming smoke will be particularly applicable to underground railroads and other works.

What I claim as new is—

1. The combination of a vertically-adjustable frame or grate and a stratum of balls, blocks, or pieces of metal supported thereon, with a stationary grate or fire-bed, substantially as shown and described.

2. The combination of a vertically-adjustable hollow grate, and vertical water-conducting pipes connected thereto, with the water-space of a boiler, as shown and described, for the purpose specified.

3. The suspending-pipes F, having suitable stuffing-boxes, the chains K, and shaft J, combined with a grate, B, crown-sheet, and water-space of the boiler, substantially as specified.

DAN. T. CASEMENT.

Witnesses:

T. B. MOSHER,

A. P. THAYER.