T. CAIN.

Grate-Bar.

No. 167,153. Patented Aug. 31, 1875.

Fig. 1.

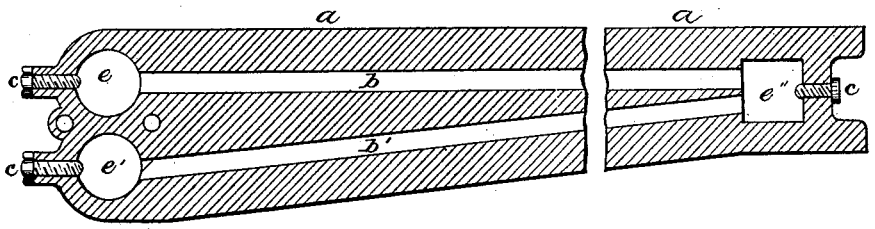
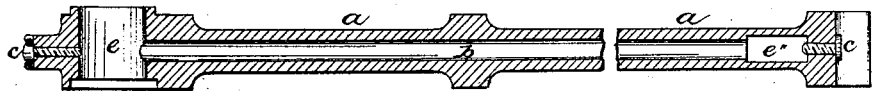


Fig. 2.



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UNITED STATES PATENT OFFICE.

THOMAS CAIN, OF LAKE DOUGLAS, GREAT BRITAIN.

IMPROVEMENT IN GRATE-BARS.

Specification forming part of Letters Patent No. **167,153**, dated August 31, 1875; application filed January 9, 1875.

To all whom it may concern:

Be it known that I, THOMAS CAIN, of Lake Douglas, Isle of Man, Kingdom of Great Britain, have invented an Improved Grate-Bar; and I do hereby declare that the following is a full, clear, and exact description of the same, having reference to the accompanying sheets of drawings, in which—

Figure 1 is a longitudinal vertical section of a grate-bar embodying my improvements. Fig. 2 is a longitudinal transverse section through the center of the upper chamber *e* and passage *b*. Fig. 3 is a vertical section through the center line of the chambers *e e'* of Fig. 1.

Like letters designate like parts in the various figures.

This invention has special reference to the construction of tubular grate-bars, whereby a continuous circulation of water is maintained therein; and it consists in the arrangement and details of parts as hereinafter fully set forth and pointed out in the claims.

The invention is designed to overcome many objections to the mode of constructing tubular grate-bars, as at the present time in vogue, and to materially reduce their first cost and subsequent maintenance. Some of the principal objections are, first, their liability to frequent leakage of the joints that connect the bars with hollow transverse bearers or the like, caused by the unequal expansion of the bars and the bearer; and second, in the not inconsiderable waste of fuel to evaporate the leakage-water.

I provide my grate-bar *a*, having the horizontal return water-passages *b b'* longitudinally therein, with two horizontal transverse chambers, *e e'*, placed one above the other in their butt end, and connect a number of them by means of bolts *f*. The two transverse chambers, *e e'*, are produced by a series of transverse openings of suitable shape through the butt of each bar in such a manner that the level of one chamber is above the level of the other, and that the longitudinal passages *b b'* radiate therefrom, and run in a straight line through the bar. The purpose of the chambers *e e'* is to provide for an equal distribution and circulation of the water through all of a series of grate-bars, and at the same time to serve as depositing-chambers for sediments or other matter suspended therein, the lower chamber serving to feed the bar, and the upper one being for the discharge. By making the passages *b b'* of sufficient size to admit enough water to keep the bar cool in proportion to the work for which it may be required, I am enabled to keep its temperature at a predetermined degree, so that it may be used for various purposes.

The jointing of a series of grate-bars is accomplished by providing each of the openings with projections on one side and with recesses on the other or opposite side, so that one will engage with the other, a packing of suitable material being placed between them to make a tight and durable joint. I make these bars either singly or cast two or more of them in one piece, and connect a series of them in precisely the same manner as single ones. The transverse section of the passages *b b'* may be circular or oblong, the latter being, perhaps, preferable on account of the narrowness of the bars. They may also be formed by casting tubes in the bars, or by using tubes exclusively without changing the principle or nature of my invention. In order to provide for proper cleaning of the water passages and chambers, I put holes in the chambers *e e'*, opposite the passages *b b'*, and provide them with suitable plugs or stoppers *c*, so that deposits in the chambers and passages may be removed by inserting scrapers or cleaners through the holes. The tail end may or may not be provided with a plug or plugs at the junction of the two passages *b b'*, or otherwise, and the cleaning operation can be performed without removing the bars.

By constructing grate-bars as described, I derive results that cannot be obtained by any other mode of construction, the principal ones being: First, a considerably lighter, and therefore cheaper, bar is produced; second, the bars are easier connected and disconnected; third, the ever-varying expansion and contraction do not injure the joints and cause leakages, the expansion and contraction transversely being out of line with the joints; fourth, the bars are easier cleaned out, and an unobstructed circulation of the water ob-

tained, as the passages radiate directly from the chambers and have no bends or angles to interfere with the circulation.

In using these bars for heating salt-water, or water holding salts in solution, or other matter that might interfere with the circulation and cause large deposits, I find it convenient to use a surface-condenser in connection with these bars, and to pass the condensed water only through them. If for cooling only, I use a cistern, with flow and return pipes to convey the water.

Having thus fully described my invention I desire to secure to me by Letters Patent—

The herein-described grate-bar, having horizontal water-passages *b b'* arranged longitudinally therein, and horizontal transverse chambers *e e'*, provided with plugs *c*, said passages and chambers being formed in the process of casting the said bar, substantially as and for the purpose set forth.

THOMAS CAIN.

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